AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 8., No. 36. WEEKLY. | NEW YORK, SEPTEMBER 5, 1885. | $2.50 per Annum. SINGLE COPIES, 5 CENTS.

COPYRIGHT 1885, BY AMERICAN MACHINIST PUBLISHING COMPANY.

For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Improved Hoisting Machinery.

We present on this page, and on page 2, engravings representing some of the hoisting machinery made by the Iron Bay Manufacturing Company, of Marquette, Mich.

The first engraving on this page represents the drum and hoisting mechanism, made in sizes of from 3½ to 20 feet diameter. The driving band is sectional or divided, and is attached to a two-armed driver, which is keyed to the drum shaft, and is operated by the use of sliding blocks and bell crank levers. Each section of the driving band is connected at one end to the opposite ends of the driver, which secures a perfect counterbalance to the machine. When the sliding collar upon the shaft is moved toward the drum, the sliding blocks are thrown outward and impart motion to the bell cranks, through which the driving bands receive a corresponding motion, and are drawn toward and clasp the drum, causing it to revolve in the same direction and with the same velocity as the shaft. As the driver rotates in the same direction as the drum, any friction created between the driving band and the drum assists in tightening the driving band, thus materially lessening the strain otherwise necessarily exerted by the bell cranks or levers.

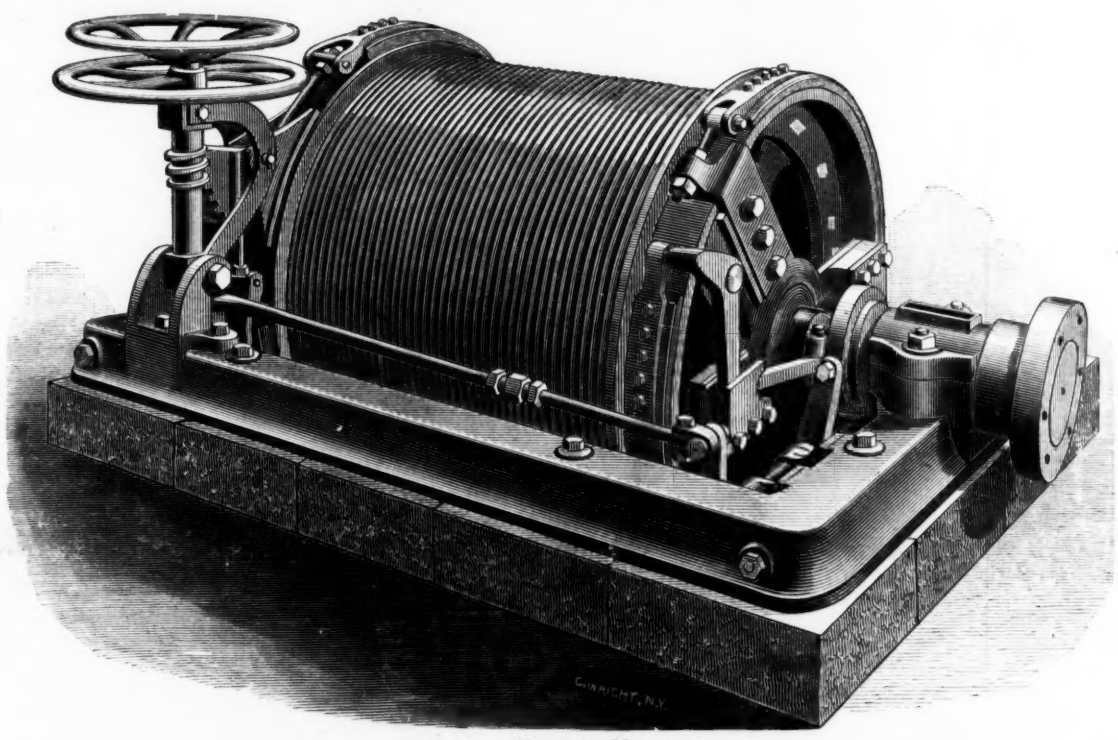
The application of power being on opposite sides of the drum, and every part being counterbalanced, the full power is transmitted from the shaft through the intermediate mechanism smoothly and steadily, without shock or jar, and with very little exertion by the operator. The mechanism employed for engaging the driving band with the friction rim of the drum is quick (only one-half a turn of the hand-wheel) and yet powerful. When the driving band is brought into frictional contact with the drum, the greatest force is upon it, and the small crank at the lower end of the hand-wheel arbor is drawn a trifle past its dead center, and will remain there until released by a reverse motion of the hand-wheel.

The lowering brake is attached to the stand by an adjustable device, which compensates for the wear of brake shoes. When engaged, the brake band is drawn towards the drum, clasping it concentrically, without tendency to draw the drum out of line.

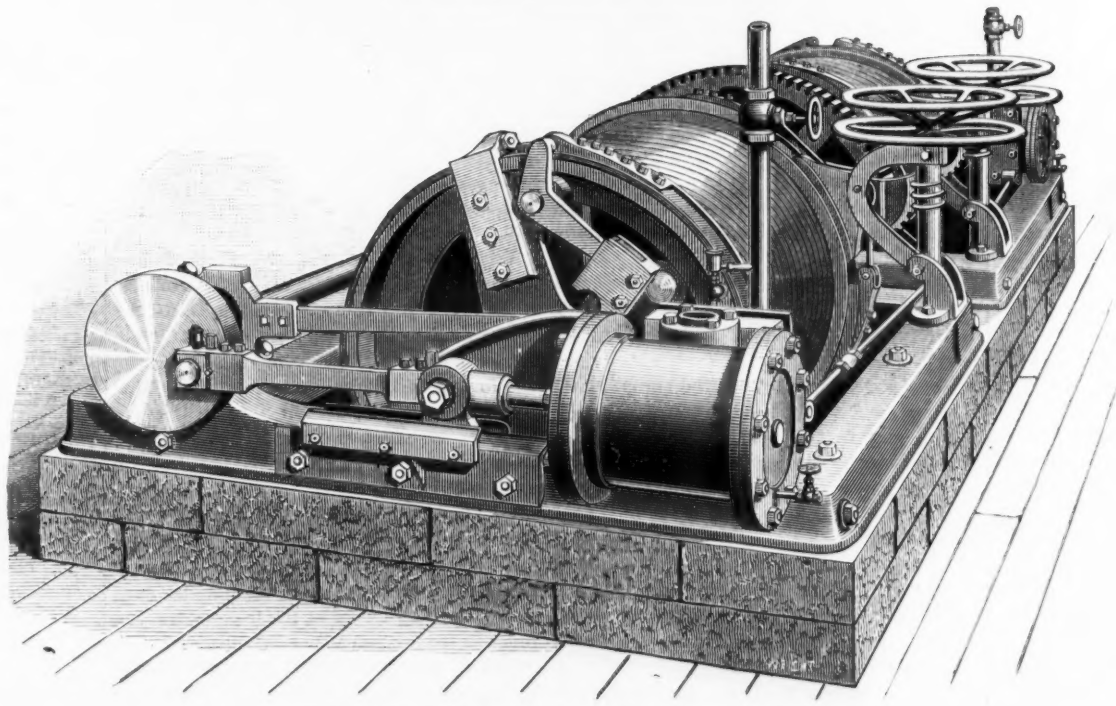
The external friction hoister is one of a class made in different sizes, with drums from 20 inches to 6 feet diameter. It has duplex engines and drums. In the one shown the cylinders are 13″×12″, and the drums 4 feet diameter and 43 inches length, hoisting 4 tons at a speed of 200 feet per minute.

All driving bands are lined with vulcanized or gelatinized fiber.

On page 2 the machine made in sizes as above, with duplex engines and single drum, is represented.



DRUM AND HOISTING MECHANISM.



DOUBLE DRUM EXTERNAL FRICTION HOISTING MACHINE.

Consul Byers, at Rome, says: "Italy, the cradle of civilization, is comparatively ignorant of the progress made in modern agriculture. Still, great strides are being made from year to year toward the use of what are deemed the best and most perfect of tools and appliances, both for tilling the soil and other purposes. As an example of this may be mentioned the adoption of electrical appliances, of which Italy now possesses, in proportion to population, more than any other country, excepting the United States. In the encouragement and advancement of agriculturists the Government has instituted depots for the exhibition and lending of agricultural machines, tools and appliances. This, with frequent district fairs, with practical trials of the articles, is doing much to make advanced appliances known and to introduce them to practical use. Still, nine-tenths of the improved machines and tools now in use are of foreign manufacture."

The Russian Government is said to have in contemplation the imposing of customs duties on ships built abroad for Russian subjects. This is to encourage ship building in Russia.

What I Know About Jigs.

BY S. W. GOODYEAR.

SECOND PAPER.

Jigs to be effective must be stiff, must be susceptible of quick adjustment, and must be so constructed as to be repaired in case of wear, with the least possible danger of alteration. There are many small jigs used in drilling but one or two holes, in which the jig, being of steel, may be hardened itself; but, it is unquestionably better to make all jigs with separate drilling pieces, or bushings, which can be replaced, when worn, with entire accuracy. In this way, the body of the jig, being left soft, the inevitable change which takes place in volume and shape of steel in hardening, is reduced to a minimum, and, as it is a well known fact that steel in small bodies hardens thoroughly hard at a lower heat than in larger masses, and, that just in proportion as the heat is low, there will be the least possible change in hardening, it is very desirable to make the detachable drilling pieces which are to be hardened, as small as will give sufficient strength, and safety from breakage in use.

Much care is required in determining from what surfaces, and bearing points on the pieces to be drilled, the jig shall take its position, and, as far as possible, this should be decided with a view to make it, as nearly as can be, impossible to get the jig on wrong. To give instructions for making jigs through the columns of even the AMERICAN MACHINIST, which so patiently allows us shop fellows to tell our stories in our own way, despite the criticisms of some of its competitors for honors in the technical journalistic field, and who assume to be too scientific, and purely technical, to open their columns to mere mechanics, will probably prove to be a "bigger job" than it seemed to me when I volunteered to undertake it, and still the jigs which I have made, loom up before my mental vision a very mountain, if I had them all to make over again.

It is best, in most cases, where jig drilling is to be done on rough work, to, in some way, by milling, planing, or grinding, secure a surface, and if need be some other base of operation, as the straightening of an edge, or end, or the turning of a boss, or hub, or other projecting part which shall surely locate the jig. In the case of work which has been roughed out, or finished before drilling, the pieces all being of practically the same size and shape, with surfaces

correct, much of the difficulty of adapting jigs to drill by accurately is removed.

Suppose I describe a jig, or the jigs, which I made for drilling the bed plate and upright part of a sewing machine together with, meaning by drilling together, drilling so that the two pieces would come together accurately, insuring the exact ranging of the center of the needle-bar, with the center of the hole in the throat-plate through which the needle must pass in use. Let us premise that the seat in the bed for the throat-plate has been milled. Now, it will be seen that by having a steel plate of some considerable thickness which accurately fits in the undercut seat for the throat-plate, this steel plate having through it a hole of exactly the size of the needle bar, which hole occupies precisely the same position relative to the seat for the throat-plate which will be occupied by the needle hole in the throat-plate itself, when in position, we have a fixed base from which to commence operations.

As in the case of all pieces in shop vocabulary, these two had names by which all hands knew them. The base foundation, bed-plate, was known as the "bed;" the upright part, or standard, was known as the "stand." To drill four holes through the bed, of such size as to fit the countersunk head screws, which were to fasten the stand to the bed, and drill them in such position as to closely approximate to the position of the four bosses which had been provided to receive the screws, at the base of the stand, and to drill them in an exact fixed position relative to the seat for the throat-plate, and reasonably central with the back end of the bed, was the object sought in making the jig for drilling the bed.

Within the space which was to be bounded at four corners by the prospective holes, there was a hole through the bed of quadrangular shape. This hole through the bed was to provide a space for the cam to run in, which was to act to vibrate the looper lever, and was perhaps two and one-half or three inches in extent crosswise of the bed, and half that in the opposite direction. What of it? This; it made the nicest kind of place to fasten the jig on by, and, in all planning of jigs there is no more valuable faculty possessed by tool-makers, than that of being able to take advantage of all the natural adaptabilities in every case, rather than to always look for something outside, and independent of the pieces under treatment. It will be seen that in this case, to fasten the jig upon the bed in the most substantial manner, it was simply necessary to have a stud pass through the jig vertically at about the center of the above-described quadrangular opening through the bed, with a strap or T-head below, and with the upper end of the stud threaded and carrying a thumb-nut, or mortised and carrying a key, or provided with a cam lever as a means of drawing up. Then, by letting the T-head drop down through the opening, and giving it a quarter turn to bring its length across the narrow way of the opening, a turn of the thumb-nut, a tap of the key, or a pull of the cam lever—depending upon which was used—would almost instantly fasten the jig rigidly in the position to which it had been brought by means of a stud, which being part of the jig, and accurately fitting the hole in the steel plate which occupied the seat for the throat-plate, had been dropped into said hole at the same time that the business end of the jig, where the drilling was to be done, had been located laterally, by projections on the lower side of the jig, which dropping into the quadrangular opening engaged with the ends of the opening.

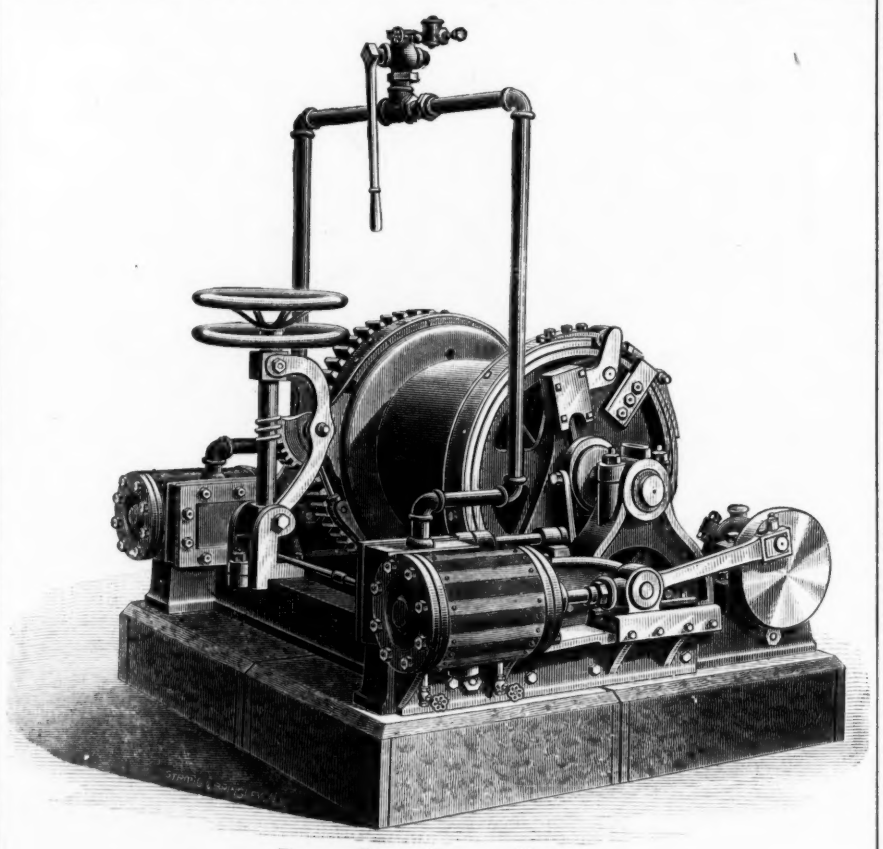
Have I made it plain? Shove the steel plate in, drop the jig into place by letting the stud at the front end pass down into the hole in the steel plate, and the projections on the under side of the jig pass between the ends of the quadrangular opening through the bed, give the head of the stud, or the strap on the stud, depending upon which is used, a quarter turn, and tighten up. The jig is fastened on. But, what is the jig? A wrought iron, or steel plate, of suitable shape, of $\frac{1}{2}$" thickness, more or less, with the four holes accurately located, and enough larger than the holes to be drilled through the bed to allow of fitting in them steel bushings. The walls of these, outside of the hole in which the drill works, are $\frac{1}{16}$", $\frac{1}{8}$", $\frac{3}{16}$", or more, in thickness as judgment or experience shall decide to be best. The bushings should be turned up on an arbor which is perfectly true. There should be a shallow head, or projecting shoulder at the top of the bushing to locate it in driving into the body of the jig. The outer corners at the top should be taken off well to obviate the necessity for cuss words at skinned knuckles. The top of the hole should be well countersunk to lessen the difficulty which some men experience in starting a drill into a hole, and who will even then have the top of the jig marked by the point of the drill outside of the bushings, and would, if the bushings were as large as a barn door; those who are careful will sometimes, without the countersink, jam the point of the drill down on to the hardened bushing. Don't let us forget to take off the corners a little at the lower end of the bushing, so that after hardening they can be driven into place without cutting the body of the jig.

Fit the bushings to the holes in the body of the jig so that they can be crowded to place, and after hardening they will usually be found to drive in about right. This is a point in favor of those who say steel expands in hardening.

Now, if a drill be used which fits the holes in the bushings, there should be no difficulty in drilling any number of beds, so that the four holes shall occupy in each exactly the same position relative to the throat-plate. Having drilled the holes, they are to be countersunk for the heads of the screws, and don't let us, for the sake of saving a trifle in making the countersinking tool, use one which, having nothing to guide it, cuts concentric with the hole, or runs out just as it happens, but let us make a good tool, with a "teat" fitting the holes, and then with the countersinking concentric with the hole, when we turn the screws home, the heads will "set some way." Too much trusting to luck in the matter of countersinking and the starting of taps is indulged in, when a guiding "teat" would insure concentricity in countersinking, and in starting taps would insure concentricity, and at the same time start the tapping vertically, or in line with the drilling, without the squinting, and cutting and trying with try-square which is so common.

Just why so many people persist in using tools which their every-day experience tells them *will* run out ninety-nine times in a hundred, when for a little more money tools may be made which *cannot* run out, is a puzzle, unless it is accounted for on the ground that it affords an opportunity to repeat many times in each day for an entire year the statement that "It's strange why that tool should 'run out;' there's just as much reason why it should run out one way as another, and no earthly reason why it should run out at all; there's just as much to cut one side of the hole as the other." * * * Why don't they add, what seems to be the fact, that believing that the tools *ought* to go straight ahead they have determined to use them, although they *know* that the chances are only about one in a thousand for their ever working closely enough to do good work.

But I am perhaps making too many words about a small matter; still, it is likely that we all agree that in turning in screws where the tapping has been of the "lean to" order, or where the countersinking or facing off for the bearing of the screw-head has been faulty, there is a strain put upon the screws which often leads to their subsequent rupture and frequent replacement, when, if the proper bearing and alignment had been had, the same screws would have lasted for successive centuries. Better substitute "Don't screw up unless a fair bearing is had for head and nut," for the too-often acted upon, if not expressed in words, "Screw it up; it will come to it."



DOUBLE DRUM HOISTING ENGINE.

Where is the other jig? Well, I had nearly forgotten that there was another to make. It is just as much work to make the jig for drilling the stand; but when we "get the hang of it," as we have in making the one for the bed, it will take less time. The jig for the stand is, of course, to be in some respects an exact duplicate of the one we have just made. The front end is to have a stud to fit in the hole in the stand where the needle-bar will work. The holes for the drilling pieces—bushings—may be of the same size as those in the other jig, and *must* be in the same position relative to each other, and to the stud at the front end. The holes in the bushings will be just as much smaller than in those for drilling the bed as the difference between the tapping size and the size of the body of screw used. One jig being made, let us make it act as a jig for forcing the other to be in the most essential parts an exact duplicate; that is, if we don't belong to the class of workmen who are so sure that they can measure, and lay out and drill within a millionth part of an inch.

This jig is nearly done. A projecting rib inside of the hollow base furnished a means of fastening it on, much as that for the bed was fastened. As this goose-neck shape furnished no reliable base of its own on which to rest in drilling, the jig was made to furnish a base from which to drill, by being made to project some two inches each side of the base of the stand, which had been planed off, these projections on the jig resting on a frame made for the purpose, with an opening to admit the upright part of the stand in its bottom-side up position when drilled.

All the steel armor plates for the new Italian war ship recently launched will be made in Italy. A gun manufactory at which guns of the largest caliber will be made, has recently been established there. Hitherto Italy has been mainly dependent upon foreign countries for heavy guns and armor plate.

The San Francisco *Chronicle* says:—"Cable cars are as much of an improvement over horse cars as horse cars are over the omnibuses of the last generation. They travel faster and more smoothly; they are more agreeable vehicles; there is less jar; they involve no cruelty to animals as the horse cars do when a team is pulled on its haunches to make a sudden stop, and forced to exert tremendous effort to get the car started again. We have found in this city that cable cars pay better than horse cars. They carry more people, and the total cost of motive power is less. The objection of danger is not serious. In this city accidents are not more frequent than they would be with horse cars or omnibuses."

New York State Apprentice Law.

There has been some inquiry recently about the most acceptable form of indenture for apprentices. It depends largely upon the apprentice laws of the different States. We print below the apprentice law of the State of New York.

LAWS OF 1871, CHAPTER 934.

Apprentices and employers; consent of legal guardian before taking minor as apprentice; indentures in writing; by whom executed.

SECTION 1. On and after the passage of this act, it shall not be lawful for any person or persons in this State to employ or take as an apprentice any minor person to learn the art or mystery of any trade or craft without first having obtained the consent of such person's legal guardian or guardians; nor shall any minor person be taken as an apprentice aforesaid unless an agreement or indenture be drawn up in writing, in accordance with the provisions of this act, and duly executed under seal by the person or persons employing said apprentice, and also by the parents or parent, if any be living, or by the guardian or guardians of said apprentice, and likewise by said minor person so becoming an apprentice.

Contents of Indentures.

§ 2. Said agreement or indenture, in order to make the law valid, shall contain the following covenants and provisions:

Must be Bound for a Term of Years.

1. That said minor person shall be bound to serve his employer or employers for a term of not less than three nor more than five years.

Shall not leave during term of apprenticeship; may compel return of apprentice.

2. That said minor person so indentured shall not leave his said employer or employers during the term for which he shall be indentured, and if any said apprentice so indentured as aforesaid shall leave his said employer or employers, except as hereinafter provided, the said employer or employers may compel the return of the said apprentice under the penalties of this act.

Agreement of employers in indentures; must give certificate in writing stating full service of apprenticeship.

3. That said employer or employers shall covenant and agree in said indenture to provide at all times during the continuance of the same, suitable and proper board, lodging and medical attendance for said apprentice, and said employer or employers shall also further covenant and agree to teach or cause to be carefully and skilfully taught to his or their said apprentice every branch of his or their business to which said apprentice may be indentured, and said employer or employers shall be further bound, at the expiration of said apprenticeship, to give to said apprentice a certificate in writing stating that said apprentice has served a full term of apprenticeship of not less than three nor more than five years at such trade or craft as may be specified in said indenture.

Non-compliance Deemed a Misdemeanor—Penalty.

§ 3. Any person or persons taking an ap-

prentice without complying with the provisions of this act shall be deemed guilty of a misdemeanor; and on conviction thereof in the court of sessions of general or special sessions, held in and for the county in which the business of said employer or employers may be conducted, shall be subject to a fine of not less than $500, the fine to be paid to the treasurer of said county for the use and benefit of said county.

Indentures, how canceled; proceedings in case of violation on part of apprentice; punishment for leaving employer; or neglect of apprentice to perform his contract, indenture may be canceled.

§ 4. Any and all indentures made under and in persuance of the provisions of this act shall not be canceled or annulled before the expiration of the term of said indentures, except in case of death; or by the order of, or judgment of the county or supreme court of this State for good cause, and any apprentice so indentured who shall leave his employer or employers without his or their consent, or without sufficient cause, and shall refuse to return, may be arrested upon the complaint of said employer or employers, and taken before any magistrate having jurisdiction of misdemeanors, who may cancel said indentures, and on conviction may commit said apprentice to the house of correction, house of refuge, or county jail, in and for said county, for such length of time as such magistrate may deem just, or until said apprentice shall have attained the age of twenty-one years, and in case said apprentice, so indentured, shall willfully neglect or refuse to perform his portion of the contract as specified in said indenture, then said indenture may be canceled in the manner aforesaid, and said apprentice so violating said indentures shall forfeit all back pay and all claims against said employer or employers, and said indentures shall be canceled.

May bring action on failure of employer to provide for and teach apprentices; and if proven, indentures to be canceld and fine imposed.

§ 5. Should any employer or employers neglect or refuse to teach, or cause to be taught to said apprentice the art or mystery of the trade or craft to which said apprentice has been indentured, or fail at any time to provide suitable and proper board, lodging and medical attendance, said apprentice individually, or his parent or parents, guardian or guardians, may bring an action against said employer or employers, to recover damages sustained by reason of said neglect or refusal; and if proved to the satisfaction of the court, said court shall direct said indentures to be canceled, and may impose a fine on said employer or employers, not exceeding $1,000 and not less than $100, and said fine shall be collected and paid over to said apprentice or his parent or guardian, for his sole use and benefit.

Indentures conflicting with this act invalid.

§ 6. Any indenture made and executed, wherein parts conflict with, or are not in accordance with the provisions of this act, shall be invalid, and without any binding effect.

Repeal.

§ 7. All acts or parts of acts inconsistent herewith are hereby repealed.

* * * * * * *

The American Institute of Mining Engineers will hold its next meeting at Halifax, September 16th 17th and 18th. Several excursions have been planned for the members. The following papers have been announced:

The Amalgamation of Gold Ores, and the Loss of Gold in Chloridizing Roasting, by C. A. Stetefeldt, New York City.

Steel Castings, by A. V. Abbott, New York City.

Lixiviation and Amalgamation Tests, by F. W. Clarke, Boston, Mass.

The Specific Gravity of Low Carbon Steels, by G. S. Miller, Benwood, W. Va.

The Manufacture of Iron in Canada, by J. H. Bartlett, Montreal, Can.

The Coal Fields of Cumberland County, N. S., by R. G. Leckie, Springhill, N. S.

The Homogeneity of Open-Hearth Steel, by H. H. Campbell, Steelton, Pa.

Improvements in Ore Crushing Machinery, by S. R. Krom, New York City.

Note on a Self-Dumping Water-Tank, by W. Ide Pierce, Tangier, N. S.

Studies in the Apatite Region of Canada, by Dr. T. Sterry Hunt, Montreal, Can.

On another page we publish the apprentice law of the State of New York now in force. We have not looked into the "Berkshire system" of apprenticeship to see whether it agrees with the law. If it does not, the stove moulders, who have been opposing that system, have a solid ground for objection.

Reed's Gas Tire-Heating Machine.

This machine is designed for heating locomotive tires for putting them on wheels, for shimming or for removing them.

In putting on tires they are usually suspended by a crane, then the machine, which is mounted on castors, is run up to them and the gas jets lighted.

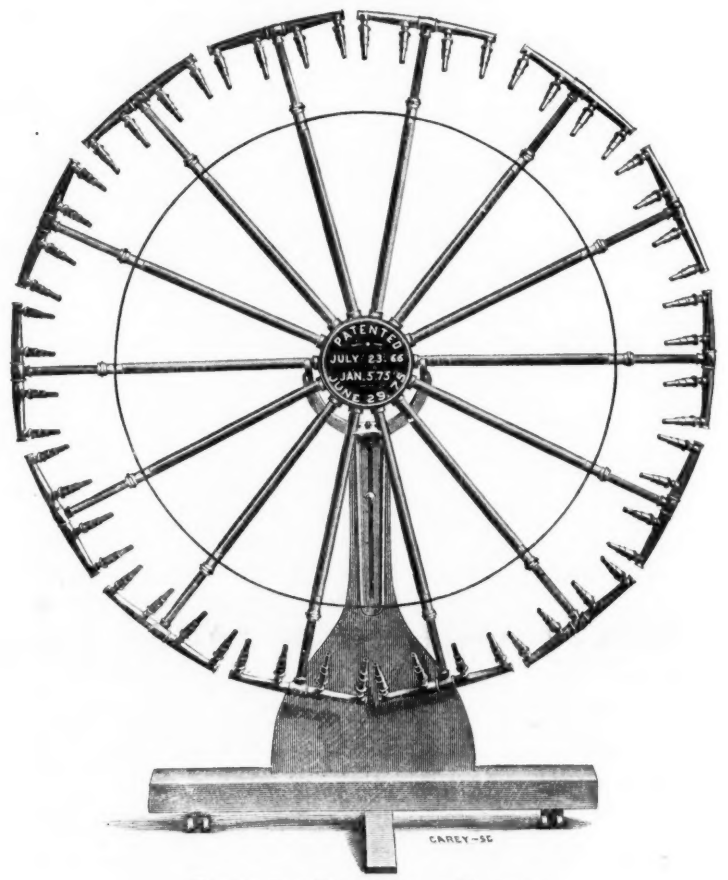
In shimming wheels they are jacked up under the locomotive, the heater run up and applied as before stated; when the tire is sufficiently expanded the shims are placed where needed.

We are informed that in some instances tight tires have been removed from wheels in five minutes, and wheels shimmed under the locomotive without removing the tires, in thirty minutes; also that a full set of tires has been put on by one man in one hour and a half.

The machine is durable and dispenses with the use of large fires, which are inconvenient and sometimes dangerous. It can be adjusted to wheels varying three feet in size in two minutes.

When city gas is not to be had a machine for making it will be furnished.

The manufacturers are Sherburne & Co., 53 Oliver street, Boston, Mass.



REED'S GAS TIRE-HEATING MACHINE.

A Labor Dispute Properly Settled.

Stove moulders in Rochester N. Y., have been on a general strike, and until recently the outlook was squally. Finally both parties to the dispute agreed to leave its settlement to an arbitration committee. Their report set matters right, and the stove works will resume business, employing all the men for whom they can furnish work. The committee's report is a model, and we print it below:

To the stove manufacturers and their employes of the city of Rochester:

GENTLEMEN:—The undersigned, appointed by you to consider and decide on the several questions of differences existing between the manufacturers and their employes, after careful, deliberate and conscientious investigation and consideration of the several matters brought before us, decide as follows:

First.—That there be no reduction in wages.

Second.—That all the men now on strike and discharged apprentices be re-employed as soon as possible, and that no others are to be employed until they are all at work.

Third.—That as the law recognizes the right in all incorporated bodies to transact their business through officials and committees, therefore the duly authorized representatives on either side should confer and transact their business with mutual forbearance and respect.

Fourth.—That heavy tools shall be charged to the men, and if only worn when returned credited back, but when improperly damaged the man in charge shall pay for the same.

The above covers, we believe, all the substantial points of differences submitted to us. We have not attempted to draw iron-clad or far-reaching decisions. We ask from all concerned a fair, manly and liberal construction and carrying out of our conclusions, trusting that with the wheels of industry once more in motion, mutual determination to do unto others as others should do to them, if positions were changed, will bring about mutual concession of difference to the end that strikes shall be unknown, and the arduous duties of arbitrators uncalled for.

We shall be amply repaid for our labors if they shall prove to have in any measure tended to so much desired results.

We take this opportunity of thanking you for the great respect accorded us and the assistance so readily, and with every evidence of fairness by both sides, afforded us. We were also glad to see, and cannot but commend, the fair and mainly manner in which both sides discussed and compared their several views, and take the liberty of saying that a full and free discussion of every point of difference between employer and employe, as they arise, will, we are confident, bring about that mutual confidence and respect which must exist between the capitalist and the laborer to enable them to achieve successfully their true mission of building up a happy and prosperous country.

All of which is respectfully submitted.

LOUIS ERNST.
JOHN SIDDONS.
J. S. GRAHAM.

A British mechanical newspaper, in giving the speed of wind, makes a gradation from a gentle breeze, at five miles an hour, to a hurricane, at 80 miles an hour. This may be the speed of a British hurricane, but it is not much of a wind when compared to an American hurricane, such as has been experienced on several occasions this summer. Our hurricanes have been gauged up to 120 miles an hour, but when they exceed that velocity the gauger generally moves his instruments to a place of safety, if he can.

The Brooklyn Elevated Railroad is a short line, and is not completed either to bridge entrance or to Fulton Ferry, yet it is doing a constantly-increasing business. About 25,000 people are carried every day. The fare is uniformly five cents. The company has added to its rolling stock, and now has 30 locomotives and 58 cars. Eighteen more cars are expected soon. The road has been in operation three months, and there has been hardly any casualty to speak of. The road is to be extended, and, if permission can be secured, the company will build two more connecting lines, each nearly as long as the original tracks.

John Roach's statement of assets and liabilities shows that he has a margin of about $2,200,000 after paying all debts. It is not a very bad failure, except for workmen who are thrown out of employment.

One of the greatest obstacles that small manufacturers and dealers meet with is a disinclination of customers to pay promptly when they are perfectly able to do so. Men trying to do business on small capital are not infrequently driven out of trade from this cause.

A Missourian has secured a patent on a churn, in which the agitating apparatus is worked by gear wheels, and the whole mechanism surmounted by a ball governor. It lacks an automatic cut-off, but we have no doubt that "early exhaust" will be secured when in operation.

The "Bulletin" of the American Iron and Steel Association says: "The existing hard times are continuing and expanding the tendency in this country to consolidate the manufacture of iron and steel in fewer hands—the financially strong and well-managed firms and companies absorbing the business and in many instances the plants of the weaker brethren."

The system of tipping in hotels is quite prevalent in this country, but it has not become so on railroads. In England, however, it seems that conductors and baggage-men are so poorly paid that they are obliged to look out for tips to eke out a living. The *Railway Review*, of London, says: "On many occasions we have condemned the almost universal practice of the tipping system, as practiced by the porters and passenger guards, especially on those lines where the passenger traffic is heavy. There is, however, something to be said on the other side of the question, as the pay of these men is so low that it would be impossible for them to live and appear respectable without assistance from the public. The officials wink at the system, although their rules prohibit the practice."

According to the London *Economist*, the French railroads increased their mileage 1.066 per cent. from January 1 to June 24 this year, and decreased their earnings 3.87 per cent. The Spanish railroads between same dates increased mileage 8.1 per cent., and decreased earnings 3 per cent. The South Italian lines between same dates increased mileage 3.98 per cent., and increased earnings 7.1 per cent. The German railroads between same dates increased mileage 2.96 per cent., and increased earnings .03 per cent. Twenty British lines increased mileage 1.2 per cent., and decreased earnings 2 19 per cent during the first half of this year. Fifty-six American lines increased mileage 1.56 per cent., and decreased earnings .76 per cent during the first five months of this year. Comparisons are made with same time in 1884.

Consul-General Cramer, at Berne, Switzerland, says:

"In few countries, if in any, is done so much to improve the method of manufacture, as well as the quality of manufactured goods as in Switzerland. The most recent cantonal and national laws affecting this question look in that direction.

"Schools and associations for the improvement and promotion of industrial enterprises have been multiplied. Much money is expended for these purposes; the benefits thereof are, however, really harvested by the purchasers or consumers of these manufactured articles. In the manufacture of embroideries and linen articles, in regard to their beauty and durability, Switzerland is unquestionably ahead of any other country in Europe. The same may be said of the silk industry.

"The Swiss manufacturers are conscientious in producing only good articles. Importers in the United States would do well to take notice of these facts; the more so, since the prices here are as low, if not lower, than those of other countries."

The Development of the Connecting-Rod.

By WILLIAM H. HARRISON.

Naturalists, Darwin and others, have taught that there are many rudimentary organs in the anatomy of animals which have remained from generation to generation, gradually becoming smaller as the time of their usefulness has passed. For example, the legs of a snake, whose remote ancestors certainly had good use for them, but now only the rudimentary bones are found under a smooth exterior. The fingers of a horse, the whole five series of rudimentary bones of which may be traced—the middle finger however having received its greatest development, nail and all, in the shape of the hoof, &c., &c.

We find a similarity in many things of every-day life. The mantel or chimney pieces in rooms which have neither fireplace nor chimney, being heated by steam pipes, or by a current of dry air, dust and coal gas, through a hole in the floor called a register. The buttons on the back of a man's coat once had their use when gentlemen rode their horses and required a convenient attachment for their voluminous coat skirts on muddy days.

The comparison holds good in regard to connecting-rods of steam-engines and other machinery, in which certain exterior forms, which once were useful, are still retained, many engine designers being led to preserve and reproduce them, either from an unquestioning belief in their mechanical correctness, or from habit, which has caused vain ornamentation to appear the most symmetrical loveliness. This I will endeavor to demonstrate by reference to the acccompanying cuts, the first three representing the ancient form, the next three the medieval, and the last two the modern or new departure; all are from measurements of rods in actual use.

Fig. 1 is of cast iron, from a beam engine, built by Boulton & Watt, 70 years ago, and still in use; a little extra weight was usually given to these rods for a counterbalance to the piston and crosshead.

Fig. 2 is the "umbrella" form, consisting of a bar of round rolled iron, and six square bars disposed about it and welded at the ends to form the stubs. The cast-iron blocking pieces maintain the stiffness. About the only examples of this rod now in use, are on the old pumps of the Schuylkill water-works in Philadelphia, and possibly on some old tow-boats on the Delaware river. My impression is that it originated with Oliver Evans, as there are none in England to my knowledge.

Fig. 3 represents the timber pitman of the Ohio river, at which the young men from the institutes on their first trip to the west are given to firing much ridicule. On analysis and consideration of the circumstances attending its origin, it will be found eminently fitted for its duty. It is verylong, the forgings are light and easy to make in an ordinary fire, the stiffness under compression is contributed by the adjoining forest, and the æsthetic taste of the engineer is gratified by the ball on the end of the key, which he sandpapers in his leisure moments. This rod has its prototype in pump rods of the Cornish mines, and so they are built to this day.

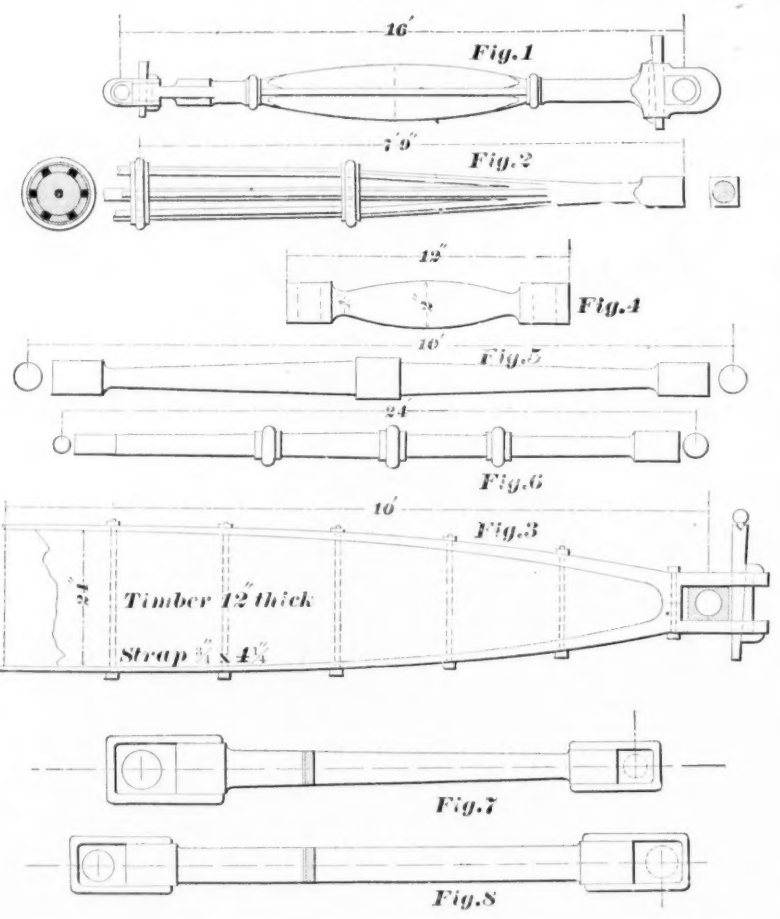
These primeval forms had their influence on the minds of later constructors after the use of solid forgings had rendered them unnecessary or harmful, for we find on the Ohio river the greatest tendency toward excessive bulging, as shown in Fig 4, which is the front link of a "doctor" or pumping engine, turned from the solid.

In Fig. 5 we find a favorite form of rod, the idea remaining that the rod should be large in the middle, and also that there would be something wrong without the central branch, which is sometimes used as a reinforce when holes are drilled for the support to truss rods when they are used.

In Fig. 6, most wonderful of all, we find three excrescences; this is evidently a lineal descendant from Evans' "umbrella," and is taken from the pumping engines of Chicago, all the connecting-rods and links of which are as shown. Whether these bunches were turned from the solid, or whether they were stuck on with "soft sodder" I have no means of knowing; they are equally useful and ornamental made in either way.

In later years the speed of engines and pressures of steam having increased, it was found that the small-necked rods were very unsatisfactory to their owners, causing frequent accidents, until one day a notable thing occurred. Some bright man reasoned: "if these rods bend in their necks we will make the necks bigger, regardless of what people say as to their looks," so that idea was worked out, and parallel rods of locomotives became truly parallel, easy to make and standing well up to their work. Such a rod is shown in Fig. 8.

Reasoning in the same way: "If a connecting-rod as heretofore made is always breaking at the crank end, we will make that end the largest part," the rod, as in Fig. 7,



was developed, which represents the new departure in locomotives.

Both these rods are smooth-forged, with a coal-tar finish, and are as well adapted to modern facilities and requirements as were the ancient constructions of Watt and Evans to their times.

Faults of Boiler Tubes.

The Hartford Boiler Insurance Company says in a recent issue of their *Locomotive:*

"Leakage at the tubes ends is one of the most frequent and annoying defects to which the ordinary horizontal and upright tubular boilers are subject, and while it is not necessarily, on its first appearance, dangerous, it indicates that something is wrong, either in the construction or management of the boiler, and it should be attended to at once, for if neglected, the resulting corrosion of the head and tube ends will speedily induce a dangerous condition. Many explosions of upright tubular boilers have resulted solely from this cause.

"Faults of construction may consist of insufficient rolling or too severe rolling or expanding of the tubes; by which the ends may be split, or cracked, so that it is impossible to keep them tight. The second defect is, perhaps, more frequent than the first. The feed-pipe is also very frequently wrongly located in the head close to the tubes, and when it is, and cold feed-water is used, the tubes in the immediate vicinity are almost sure to show a chronic leak.

"A heavy coating of scale on the heads between the tubes is sure to set them leaking severely, as the water is thus kept away from the head and tube-ends, and they become overheated. In this case the only thing that will do any permanent good is to remove the cause, that is the scale, when generally if the defect has not existed for too long a time, the tubes may be rolled and made tight again. But a comparatively short time of severe leakage in this case is pretty sure to so severely corrode the ends that new tubes are required.

"This collection of scale is also a fruitful source of burning and cracking of the back tube-sheet. The front end of the boiler is not so much subject to this action, as the heat to which it is subject is not so intense.

"The removal of a heavy coating of incrustation from between the tubes of a boiler is sometimes a matter of some difficulty unless due intelligence is used. With 'staggered' tubes, very bad water, and where the boiler is worked hard, the case is much complicated, and the almost sole reliance is a judicious use of solvents, coupled with proper cleaning, as often as the boiler can be spared for the purpose. With properly arranged tubes, much help can be obtained by the use of proper chisels and scraping tools. Still no rule of procedure can be given that will apply to all cases. A thorough examination of each case is always necessary to determine the best method of procedure, and it is always easier to keep a boiler clean, than it is to clean it after it is badly fouled."

The Amalgamated Association of Iron and Steel Workers have acted wisely in establishing a labor bureau for collecting reliable information from all parts of the country regarding the industries in which they are most interested. Subordinate lodges are to report weekly to the general officers the number of men employed, and the number who are idle, also the amount of iron and steel on hand, as well as other special information of value to the trades. These reports are to be published weekly in their representative newspaper the *National Labor Tribune*, of Pittsburgh. As the Association is very large and covers every iron-making district in the country, it has unequaled facilities for gathering the information wanted.

"I have noticed," said a brakeman on the Pennsylvania Road yesterday, "that no two engine bells ring in the same note. This seems rather strange, too, for they are all made of precisely the same metal, are cast in the same mould, and manufactured in the same factory.—*Asbury Park Journal.*

Martineau & Smith's Hardware Trade Journal of Birmingham, England, says;

"The general adoption of steel for iron causes greater activity at some of the works producing steel ingots, which are now used in the mills for certain purposes in substitution of the ordinary puddled bar. Hence, the prophecy of thirty years ago, when the Bessemer process was first introduced, is being realized—that hand-puddling by the iron-worker would sooner or later come to an end. It will not be entirely abolished, however, until steel can be made of such a quality that it will weld as well as iron. Blacksmiths cannot do much with steel as it is now made; that is where welding is required. Steel ingots and blooms are now delivered at the mills at about £4 per ton—a ridiculously low price when compared with the puddled iron made in the old-fashioned manner from the pig. The latter, if of best quality, costs £3; and then there is the cost of fuel and labor to convert the pig-iron into puddled bar, to say nothing of the "waste" of the pig-iron in the performance. Cheap steel adds to the other difficulties which the poor ironmaster has now to contend with."

Business is beginning to pick up at the Brooklyn Navy Yard. Some hundreds of additional workmen have been employed. *The Brooklyn Eagle* says:

"The dry dock is being prepared for the reception of the vessels that are to be fitted out. Most of these vessels have been a long time out of commission. The Richmond has not seen service for many years. She is an old fashioned hulk, and was built during the war. The Powhatan is probably the oldest sidewheel steamer in the country, and the Government intends to patch her up until she is beyond repair. The Essex is also an antique ship, and has been around the world several times. She recently made one of the longest cruises ever made by an American steamer."

Following is the law against truck-pay in the State of Ohio:

"It shall be unlawful for any person, firm, company or corporation to sell, give, deliver or in any manner issue directly or indirectly, to any person employed by him or it, in payment for wages due for labor, or as advances on the wages of labor not due, any scrip, token, check, draft, order, or other evidence of indebtedness payable or redeemable otherwise than in money."

Many of the syndicates and large coal mining companies in the State have bewailed their loss in abandoning the truck-pay system. They had their employes at their mercy while permitted to pay in "store orders."

One of the Bessemer Steel Companies in Pennsylvania has hit upon a novel and a very good form of inducement to their employes to remain continuously in service without going on strike. After they have been employed for a year they increase their regular pay one per cent., and one-half of one per cent. every six months thereafter, up to five years' service. The increase, however, is too slight to be a very strong inducement. Besides, the rates of wages can be reduced by the Company at any time. In adjusting rates of wages the company will probably take into account the extra percentages they have agreed to pay.

To cut glass tubes by electricity, an iron wire ½ mm in diameter is wound around the tube at the place required to be cut, and the ends are connected by means of copper conductors of the same diameter with the poles of a powerful battery. This iron becomes heated when the current flows, and it is only necessary to cool it suddenly with a few drops of cold water, in order to procure a clear cut. Glass tubes four inches in diameter are now cut in this way.

The Forida Southern Railroad is building to some point on the coast near Charlotte Harbor. A thousand men are engaged on the work, and the force is being daily increased. J. D. Hollister is superintendent of the road.

Modern Locomotive Construction.

BY J. G. A. MEYER.

EIGHTH PAPER.

STEAM PORTS AND EXHAUST PORT.

Figs. 20 and 21 show the steam ports and the exhaust port. The form of these, also the length, breadth and area of the same, are now to be considered and determined.

In Fig. 21 it will be noticed that the ends of the steam ports have the form of a semi-circumference of a circle, and the straight lines surrounding the exhaust port are joined by arcs, whose radii are equal to those of the semi-circumferences of the ends of the steam ports. Ports formed in this manner are superior to ports with square ends, because the sliding surfaces of the valve, and a valve seat having square-ended ports, are liable to wear into grooves and ridges, particularly at the angles. Again, making the ends of the ports semi-circular, as shown, we add strength to the bridges. This form of ports will also enable us to true up the whole port with a milling tool, also facilitate the application of a template which is to guide the milling tool, and thus making the ports in all cylinders of one class exactly alike in regard to length, breadth and distance between them; such accuracy is a matter of great importance in locomotive engineering.

The length of a steam port is, within certain limits, a matter of choice. The length is often made equal to the diameter of the cylinder, sometimes a little less, but should never be less than $\frac{3}{4}$ of the diameter of the cylinder. When the length of a steam port has been established, then its breadth must be such that the port will have the proper area. Here, then, we see that before both the length and the breadth of a port can be decided upon, the area of the port must be known. We have already pointed out that the steam-way has a double duty to perform, namely, to admit steam into the cylinder, and to conduct it out of the same. To conduct the steam out of the cylinder requires a steam-way of greater cross-section than that which simply admits the steam; and since the port area really represents the cross-section of a steam-way, we conclude that the port area for conducting the steam out of the cylinder must be greater than would be required for admitting the steam. The reason of this is that, when the steam is admitted into the cylinder, the pressure of the steam is very nearly constant, because the pressure is sustained by the flow of steam from the boiler, and, consequently, the velocity of the steam will be nearly constant. But, on the other hand, when the steam is allowed to escape, the pressure of the steam is generally less than it was when it entered the cylinder, and therefore the velocity of the steam will be slower. Again, as the steam continues to escape the pressure in the cylinder becomes gradually lower, and consequently the velocity also decreases. Now, the steam must be discharged as quickly, or nearly so, as it was admitted; but, since the velocity of the steam is slower when it flows into the air than when it flowed into the cylinder, the area of the steam port for the release of steam must be larger than the area that would be required for the admission of steam. We therefore conclude that if the area of a steam port is large enough for the release of steam, it will always be large enough for the admission of steam.

We find in the valuable work of D. K. Clark on Railway Machinery, that for a piston speed of 600 feet per minute, a good exhaust will be obtained when the area of the steam port is $\frac{1}{10}$ the area of the piston, the steam being in an ordinary state as to dryness. Assuming that for a slower piston speed the area of the steam port must be proportionately less, and for a faster piston speed proportionately larger, we have all the data necessary to find the area of the steam port suitable for any given diameter of cylinder and piston speed. Now, since for a piston speed of 600 feet per minute the port area must be $\frac{1}{10}$ of the area of the piston, and for other speeds the port area must be in proportion, we may put our data in the following form:

600 is to { the given piston speed in feet } as { $\frac{1}{10}$ of the piston area in inches } is to the port area;

or thus:

600 : { the given piston speed in feet } :: { $\frac{1}{10}$ of the piston area in inches } : the port area.

But writing our data in this form we recognize a statement of the simple rule of proportion; in order, then, to find the required port area we must follow the rule of proportion, consequently we have

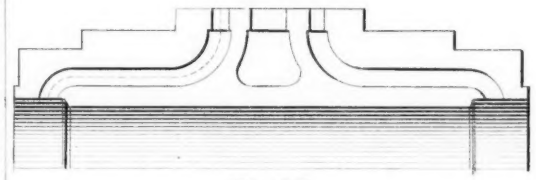


Fig. 20

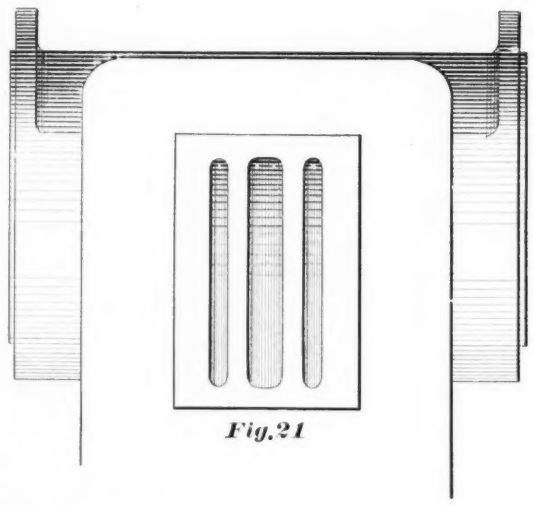


Fig. 21

Rule 5.

$$\frac{\left\{\begin{array}{c}\text{Given piston speed}\\ \text{in feet per minute}\end{array}\right\} \times .1}{600} = \left\{\begin{array}{c}\text{port area in fractional}\\ \text{parts of piston area.}\end{array}\right\}$$

In ordinary language this rule would read: The given piston speed in feet per minute multiplied by $\frac{1}{10}$, and this product divided by 600, will be equal to the port area in fractional parts of the piston area.

Then, multiplying the area in square inches of the piston by the port area found by Rule 5, we obtain the number of square inches that the steam port area must contain.

Example 8.—Find the steam port area suitable for a cylinder 17 inches in diameter, and a piston speed of 650 feet per minute.

According to Rule 5 we have

$$\frac{650 \times .1}{600} = .108$$

that is, the port area must be equal to $\frac{108}{1000}$ part of the piston area. The area of a piston 17 inches in diameter is 226.98 square inches, hence

$$226.98 \times .108 = 24.51384.$$

This means that the steam port area must be equal to 24½ square inches for this particular piston speed. Of course, for slower piston speeds, this port area should be less. For instance, if the piston speed is to be 500 feet per minute, and the diameter of the cylinder 17 inches, as before, we have

$$\frac{500 \times .1}{600} = .083;$$

and the piston area $226.98 \times .083 = 18.9$ sq. inches for port area.

With the aid of Rule 5 we may arrange the following table, showing the ratio of port area to piston area. This table will be found useful and convenient, because with it the area of the steam port can be found with less time and labor:

TABLE 9.

Speed of Piston in Feet Per Minute.	Port Area in Fractional Parts of Piston Area.
200.....	.033
250.....	.041
300	.050
350.....	.058
400.....	.066
450.....	.075
500	.083
550	.091
600	.1
650.....	.108
700.	.116

Rule 6.—To find, with the aid of Table 9, the area of a steam port suitable for a given diameter of cylinder and a given piston speed: Multiply the area in square inches of the piston by the decimal fraction found in Table 9 on the same line that the given piston speed is indicated, the product will be the steam port area in square inches.

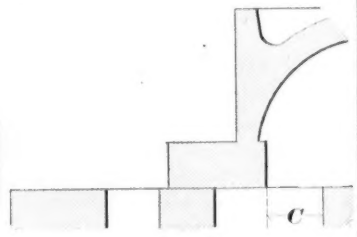


Fig. 23

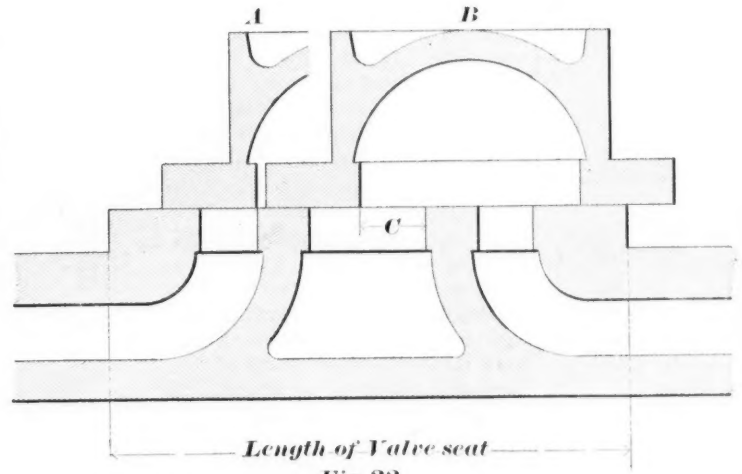


Fig. 22

Example 9.—Find the area of a steam port suitable for a cylinder 14 inches in diameter, and a piston speed of 450 feet per minute.

The area of a piston 14 inches in diameter is 153.9 square inches; referring to the piston speed of 450 feet in Table 9 we find on the same line the decimal fraction .075, hence

$$153.9 \times .075 = 12.5425;$$

that is, the steam port area should be equal to 12½ square inches.

We have already stated that the length of the steam port should be equal, or very nearly so, to the diameter of the cylinder, and not less than $\frac{3}{4}$ of the same. If, then, the length has been decided upon, we simply divide the area of the steam port by the length, and the quotient will be the necessary width of port. Or, if we are compelled to adopt a certain width for the steam port, we divide the area of the port by the width, and the quotient will be the length of the port. In these calculations, for the sake of simplicity, we consider the ports to have square ends, as the area that is lost in making the ends circular is so small that it may be neglected.

The length of the exhaust port is always made equal to that of the steam port. For finding the breadth of the exhaust port, a graphic process has been here adopted, and such as, the writer believes, will be easy to follow and understand. Fig. 22 shows a section of a slide valve, exhaust and steam ports. The valve is shown to stand in two positions on the valve seat. When in the position marked *A* the valve stands in a central position, that is, midway of its extreme travel, and when in position *B* it stands at one end of its extreme travel. In this latter position we notice that the opening of the exhaust port is considerably contracted, and should, then, the opening *c* be much smaller than the width of the steam port, the free escape of the exhaust steam would be interfered with.

We consider it to be good practice to make the exhaust port wide enough so that when the valve stands in an extreme position, as at *B*, the opening *C* will then be equal to the width of the steam port. Therefore, to find the width of the exhaust port, first indicate on paper the width of the steam port and the thickness of the bridge, see Fig. 23. On these draw a portion of the slide valve in an extreme position, as shown, and then make the exhaust port wide enough so that the opening *C* will be equal to the width of the steam port. Generally, when this rule is followed, the width of the exhaust port will be equal to about twice that of the steam port for locomotive engines; hence it is often said, that the width of the exhaust port should be equal to twice that of the steam port for all engines. This statement should be received with caution, as it might lead to error. Following the graphic method here explained, satisfactory results will always be obtained.

The valve seat for locomotive cylinders is generally raised one inch above the surrounding surface, so as to allow for wear.

The length of the valve seat (see Fig. 22), should be such that the valve may considerably overshoot it at each end of the travel when in full gear; this will promote uniformity in wear, but care must be taken not to make the valve seat too short, because then the steam would pass underneath the valve into the steam port.

Manager Locke continues to work on the problem of lighting the Hoosac tunnel. He is of the opinion that some sort of an engine will ultimately be used in the tunnel which will not make any smoke, and that when this is done the tunnel can be lighted with electric lights. When this is accomplished it will become popular for excursionists, who will pass through, stopping at the central shaft where they can climb up the stairway through the galleries to the base of the shaft and take a look to the top of the mountain, over 1,000 feet above. It is proposed to build a platform out into the shaft and have it so arranged that the people who visit this unpoetic spot can take in the vast height without being drenched by the constantly falling water.—*Springfield Republican.*

A correspondent of the *National Labor Tribune*, says: "On the line of the Chicago and Northwestern Railway, between Chicago and Milwaukee, 65-lb. steel rails are being substituted for 56-lb. steel rails, as the traffic is constantly increasing and a heavier rail is deemed necessary. A portion of the 56-lb. steel rails being taken up were made by the North Chicago Rolling Mill Co., and laid 14 years ago. A close inspection shows them to be scarcely worn and the ends not battered. They are to be laid on another line of the road where the traffic is not so heavy, and where a lighter rail will answer than on the line from which they have been taken. I am informed by those who ought to be competent, as they are experienced railroad men, that they feel confident that these 56-lb. rails will last six years longer under the lighter traffic in their new place.

Commissioners in several European countries will inquire into the causes of business depression.

LETTERS FROM PRACTICAL MEN.

How to Get Information in Boiler-making.

Editor American Machinist:

The members of our little society are gratified at the appearance of the initial paper from Mr. Marshall on laying out boiler work. Many boilermakers will undoubtedly through these papers see an opening for improving themselves in matters that they know but little about.

As Mr. Marshall has previously stated, ignorance is more prevalent amongst boilermakers than amongst many other craftsmen, and there are some reasons for it. Almost every effect produced by a boilermaker is brought about by physical effort; this for ten hours a day in a noise and din that makes exchange of ideas about impossible. But let us see what we can do: With two hours a day for 300 days in the year to study, and we have 60 days of 10 hours each. The amount of information that can be gained in 60 days will astonish those who will devote that time to it.

We have several "Browns" here, who may now see their way clear to improve their methods.

Detroit, Mich. J. C.

Raising Water With a Siphon.

Editor American Machinist:

In answer to G. S., August 22d, would say I brought water a distance of about 2,000 feet in a $\frac{3}{4}$ in. siphon, the perpendicular fall being about 80 feet. In the first 900 or 1,000 feet from the spring, the elevation (above the spring) was 26 or 27 feet. It ran for over a month, until I took it up to put down a larger pipe. The large one, $1\frac{1}{4}$ in., never was satisfactory. I think G. S. could get enough water from a $\frac{3}{4}$ in. siphon, if properly put down. J. J. WARING.

Milford, St. John, N. B.

Separating Brass from Wrought Scrap.

Editor American Machinist:

In your issue of August 29th, "Kid's" suggestion that a tumbling barrel be used to separate the dirt and brass from wrought scrap, in order to make a perfect forging will, no doubt, work well as far as dirt is concerned; but, my experience as a foundryman has proven to my satisfaction that, in tumbling brass and iron together, the former takes on a coating the exact color of the latter; that is if the tumbling is continued until the iron is bright, the brass can hardly be distinguished without scraping the surface.

M. E. CHANIC.

Balancing the Reciprocating Parts of Steam Engines.

Editor American Machinist:

The letter of C. L. Redfield, August 15th, calls to mind Professor Robinson's paper before the Society of Mechanical Engineers, at Altoona, on the same subject, in which he pointed out that by the use of a "fan-tail" connecting-rod it was possible to balance the parts of an engine almost perfectly, as is also shown by Mr. Redfield.

To readily determine the effect of a change in the condition of things, it is well generally to carry it to an extreme, and Professor Robinson's fan-tail connecting-rod is only the carrying of Mr. Redfield's suggestion to the limit.

But I am of the opinion that neither Professor Robinson nor Mr. Redfield have given the correct interpretation to the result of their balancing devise, not but what the result might be as good or better than they anticipate, but I believe, when the connecting-rod is prolonged, as suggested, so as to bring the center of gravity in the center of the crank-pin, that then the connecting-rod ceases to be a reciprocating part entirely in its effect towards equalizing the pressure on the crank; and so, too, I believe, if the fan-tail be made large enough to counterbalance all the reciprocating parts, then there will remain no element in the reciprocating parts to equalize the pressure on the crank-pin; or, in other words, that the effect on the crank-pin will be no different than if the same mass of metal was made into a round disk and hung on the crank, and the impulse from the steam was communicated to this disk by parts having no weight whatever. Of course, if this assumption is true, then it will be a much better use of the metal to put it in the rim of the fly-wheel, so far as maintaining uniform motion is concerned.

But two points are claimed for the use of heavy reciprocating parts: uniform pressure, tending to give uniform motion, and less wear on the pin. If the same metal is as effectual in giving uniform motion when put in the rim of the fly-wheel as in the cross-head, then there only remains the advantage of endurance in the crank-pin. No matter what our theory may be, does not the fact that the crank-pins, with their unequal and alternate pressures, endure more punishment than any other journal about the machine, admonish us to think twice before we spend too much to change the pressure from an unequal to an uniform one? Does the result of experience prove that there is anything better than to make the parts as light as will stand, and partially counterbalance in the case of the overhanging crank, and counterbalance to the full extent in the center-crank engines, where a solid foundation is obtainable? JOHN E. SWEET.

Boring Brass Cylinders.

Editor American Machinist:

Once upon a time it fell to the lot of the writer to re-bore a lot of brass tubes or cylinders. They were about five feet in length, and five inches internal diameter, one end closed. Smoothness was the only quality absolutely required of the holes. The job was given the writer with the remark that if the time spent on each one exceeded a week, money would be lost on the job. Left to his own devices, the writer hunted up a chunk of cast iron about a foot long—the end of an old shaft. A 2-inch hole was drilled in one end, about 6 inches deep, the piece fitted to a mandrel and turned down to about $4\frac{1}{2}$" diameter. Six slots were then planed the entire length, $\frac{3}{8}$" wide and $\frac{3}{4}$" deep. The spacing of the slots was as even as could be guessed at without too much squinting. Into these slots strips of steel were fitted and turned to size of hole required. They were then backed off and cleared at the ends. A large-sized shell reamer was the result of this work. The strips of steel were hardened after the Goodyear plan, which, when intelligently followed, *always* gives the best results.

With one end of the cylinders in the chuck and the other in the steady-rest, the hole was started with a boring tool, and then the reamer entered; the "tail-stock feed," vigorously applied, did the thing in a shape that surprised even the operator himself. The reamer worked so nicely that more than once he stopped and withdrew the reamer to satisfy himself that it had not run into a "big spot." But no! A clean-cut surface, without mark or blemish, save the slight burnish made by the withdrawing of the tool, was all that could be seen. The proprietor and the writer were both elated over the success of what to both was an experiment with new tools. The proprietor is still happy; but about a month ago the writer got hold of an old AMERICAN MACHINIST, wherein he found described the method pursued by Mr. F. F. Hemenway in boring hydraulic elevator cylinders. He is a pioneer no longer, but only one who was walking in an old path, but did not know it.

Nor does he think that a reprint of some of the letters from "Practical Men" in former numbers of the AMERICAN MACHINIST would be a thing much out of the way.

An exchange of ideas is something that will benefit every mechanic. The time of trade secrets has passed, and the AMERICAN MACHINIST has done more than any other one thing to bring about this result. Why there are not more machinists in each shop that read it, is one thing the writer has never been able to understand; but one thing he does understand, and that is, why the readers of it are, as a rule, the best men in every shop.

F. L. JOHNSON.

A Defective Safety Valve.

Editor American Machinist:

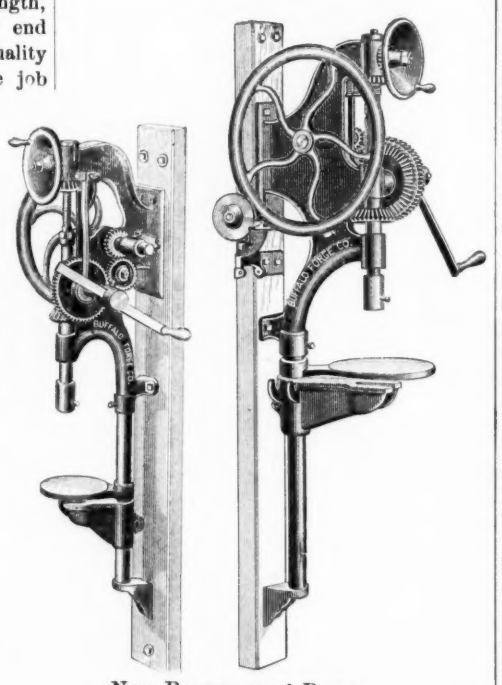
Last winter I had some experience with a safety valve, a knowledge of which may help some of the readers of the AMERICAN MACHINIST who may strike a similar case. Upon firing the boiler in the morning, when the pressure got within about twenty pounds of the point at which the valve should blow, it would give a spasmodic puff, sometimes of sufficient force to cause the weight to rebound two or three times, causing a succession of puffs, each lighter than the preceding one; then it would blow a little, like a leaky valve, until the blow-off point was reached; then it would act naturally during the remainder of the day.

One day the mill was idle, and I determined to find the cause. When I discovered it, it was so simple that it seemed any fool ought to have known what it was, but it had puzzled several of us. I began at the weight and worked toward the seat, and when I got there the mystery was greater than ever. Finally, I put my hand into the opening and *pulled up* and the seat moved; then I pushed down, and it moved back. The body of the valve was of the old style, urn-shaped, and the seat was in a brass bush fitted down to a square shoulder or seat of babbitt metal, poured around it and caulked down. There was nothing to hold this babbitt except a shallow grove around the casting, the brass seat being tapered up to hold it in place. When steam was down, the weight on the lever forced the seat down sufficiently hard to cause adhesion of the rough surfaces so as to resist several pounds' pressure. When the steam began to rise, acting on the increased area of the bush, it would raise the weight with considerable less pressure than that required when acting on the valve alone. Then the adhesion of the rough metals required a little more pressure to overcome it, and the steam would blow between the bush and iron, causing the puff that puzzled us; the soft metal would strike the top of the groove, and the pressure and weight being so nearly balanced, it would rebound, causing the succession of puffs. Finally, a little increase of pressure would seat the soft metal permanently against the top of the groove in the casting, making the joint substantially steam tight, and at the proper pressure the valve would act regularly.

The valve had been ground in and the soft metal caulked time and again, always with the same results—after a day or two it would leak. A new valve and bush had replaced the old ones, but without avail.

I made a drill a little more pointed than the ordinary drill, and drilled through shell, babbitt, and about $\frac{3}{8}$" into bush from opposite sides. Then I fitted two pointed screws, and screwed them as hard as I could without springing the bush, caulked the soft metal, and ever since it has behaved as a safety valve ought to behave. FRANK HILL.

Westport, Mo.



NEW BLACKSMITHS' DRILLS.

Smoke-Stacks and Spark Arresters.

Editor American Machinist:

I was interested in reading the report of committee on smoke-stacks and spark-arresters of M. M. Convention in your valuable paper, and the thought occurred to me that those gentlemen were working on the wrong end of the engine. While on a trip over some of the large trunk lines a few weeks ago, and in speaking to a M. M. about the working of extension smoke-boxes, he said they were an expensive thing on freight engines, but the suburbs of our large cities run out so far that they had to use them. But, he remarked: "We haul away 18 carloads a week of sparks, and that is most all fuel." Eighteen carloads, at 20,000 lbs. each, can easily be figured. I saw, recently, some one speaking of a certain extension smoke-box who said they emptied out, I think, 20 bushels in 15 miles. I have no desire to own an invention like that. No wonder railroads go into receivers' hands—rather costive, as the old lady said.

Mr. Frank Smith spoke about railroads running less than 3" nozzles invariably coming to grief. He also spoke about back pressure in cylinders, etc. Very good logic, all; Mr. Smith's head is level on that.

But I conceive that the best extension is to be made on the fire-box end, and it is only a matter of time when the master mechanics and purchasing agents will see it. This will give more thorough combustion, less smoke, no sparks. I say the proper place for sparks is in fire-box, where they belong. I know some parties use hoppers and steam jets to drive them back into the fire-box, like the boy dragging his sled up the hill to skid down again.

This company has several good engines, 17"x24", 18"x22", etc., and pay an average of $3 per ton for coal. We had heard about locomotives with large—very large—fire-boxes. I said that is the true theory for economy and high speed. They concluded to try one, 18"x24", with Wootten boiler, 8 ft. 6 in. by 8 ft. fire-box; 345 tubes, $1\frac{1}{2}$ in. diameter; 68" drivers; total heating surface, 1415 feet. After working a little while, we kept increasing size of *single nozzle* from $5\frac{1}{2}$" until it is now $6\frac{3}{8}$". I wonder if there is another locomotive in the United States with one larger than that? We haul freight, and sometimes large excursion trains, over pretty heavy grades to Gettysburg. This engine hauled President Cleveland and his company in grand style and time. The report from coal yard is, that this engine hauls the same trains *with just half the coal the other engines do.* We expect to save enough coal in one year to pay the royalty on the fire-box. We are not bothered with sparks, black smoke scarcely any, steam always plenty. Mr. Henesey, of Baldwin Locomotive Works, who built her, says this is the only engine reported to them as making *too much steam;* but by enlarging nozzles and using register in front door we have got that down fine. The firemen say it is a picnic to fire her, and they get sick sometimes when they have to change.

Now, I just state these facts to induce thought. Any man, who is not prejudiced, will do well to turn his thoughts of improvement to the other end of the engine. Some engineers of an adjoining road look down the smoke-stack, sometimes, at the nozzle of the engine I refer to, then you should hear them—"bucket," "barrel," "hogshead," etc. JOHN J. BINGLEY, M. M.

Hanover & Gettysburg R.R.

New Blacksmiths' Drills.

The new blacksmiths' hand and power drills, illustrated on this page, are made by the Buffalo Forge Co., Buffalo, N. Y.

The hand-wheel is in front of drill, facing operator, which admits of instantaneous recovery without changing position.

The feed pawl engages teeth on back of hand-wheel, thus avoiding all danger of in-

jury to the hands, an objection to which some drills are open. The automatic feed is simple in form and positive in action. But three parts enter into its construction, and it can be easily changed from hand to automatic feed, or *vice versa*, as well as from coarse to fine feed. This is a distinguishing feature. The bit bores at all times square with the table, which is finished and adjusted to admit of wood-boring or drilling, with work resting on floor.

When using a large drill for small, light work, the fly-wheel can be dispensed with by loosening a set-screw and releasing the intermediate gear. The drills are made in five sizes, and ten different styles, with and without emery wheels, and for hand or power.

A Pittsburgh reader sends us the following clipping from a daily paper, which he does not name:

There is a good deal of attention being given just at present to natural and other gas matters among manufacturers and other business men, the lately closed deal having led many to fear that another attempt is to be made to consolidate the two leading companies into a monster corporation capable of swallowing all new ones that may spring up without the preliminary of greasing. A gentleman who has given the matter much attention does not fear the community will ever be made to suffer from a natural gas monopoly, and for this reason: There is plenty of natural gas territory as yet undeveloped, and plenty of that sufficiently developed to guarantee the getting of good wells. Should the present companies consolidate and put up the rates, there would be nothing to prevent a large manufacturing concern, or two or three of them, from getting a well and putting down a pipe line of their own. The expense of this would be large, probably $150,000, but when you consider that a number of establishments are paying $50,000 per year for gas, you will see how well they could afford this expenditure. Another thing: At present rates it is probable the stockholders of the large gas companies will get their money back in three or four years, and after that would be satisfied with 12 or 15 per cent. dividends, if a cutting down to the latter were rendered necessary by the keen competition.

Natural Gas.

BY J. HARMAS KATZ.

In what follows I have endeavored to answer a few of the questions recently propounded in the AMERICAN MACHINIST.

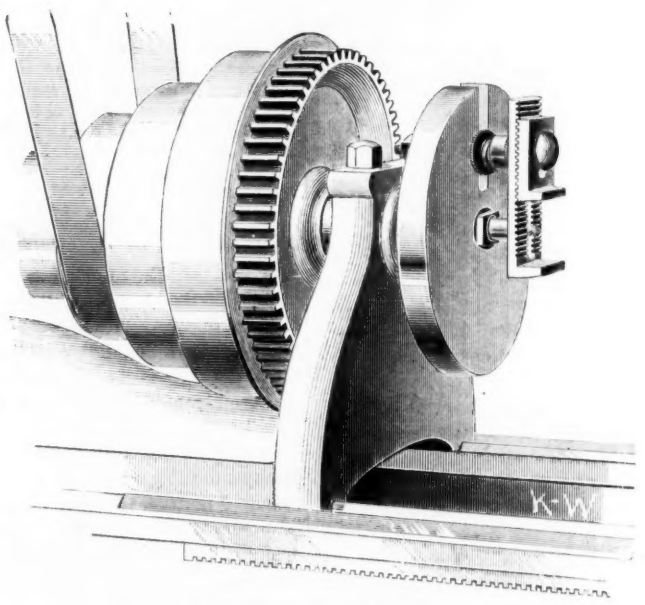
There are four belts on four sides of Pittsburgh from fifteen to twenty miles from the city, of which the one on the east is the great vent from the center of the earth, of which the others may be but lateral leakages. Owing to friction in pipes gas will not force itself through more than twenty miles of pipe, and then in small quantities, except from the eastern belt, where no limit has been found. No gas has ever been found outside of this region, except in small pockets, which are soon exhausted, and for geological reasons none probably will be found.

Wheeling has given up Virginia and come away to the Washington County belt; which owing to lack of pressure, will hardly force gas to Pittsburgh. If Wheeling can get any at all it will cost more than coal, and it is impracticable to compress and pump it; neither can it be piped to Youngstown, except by laying a steel pipe thick enough to stand two thousand pounds pressure per square inch, sufficient to push it 90 miles from the eastern belt.

The Murraysville region is the great anticlinal, the highest rocks, like the dome of a boiler; the first place gas would break through from the center of the earth, where I believe it is still generated faster than used, and where it is compressed almost to a solid. The gas wells on this belt all lie on a straight line, the extreme wells six miles apart, and if a well is drilled a few hundred feet to one side of a fissure it will not put out much gas, but only requires to be shut off a few seconds to burst any pipe, showing that the crevice leading from the fissure is small. Gas, after coming through a quarter of a mile of rock, comes out at from two to three hundred pounds per inch blowing pressure, with a noise so great that with cotton in the ears, and hands held over them hard, one cannot approach. The first well struck, nearly ten years ago, is just as strong—some say stronger—to-day, although wells equal to it are right beside it. Enough wells, I believe, could be drilled on any fifteen acres of this belt to run every factory in the United States. Gas can be piped to this city (Pittsburgh) for ¼ to ½ a cent per thousand feet, and if several factories go together up the river, where land is cheap, their fuel will cost (as is the case with some glass works) the interest on the money used in sinking a well in one of their back yards.

Natural gas will produce great heat. It has seven times more heat units than the best Siemens' gas produced, and as it costs at least 25 cts. per thousand feet to produce the poisonous and useless water-gas, interested parties are making so much fuss about, and as it would take about seven cubic feet of it to equal in heat one of natural gas, the possibility of neutralizing the advantages of Pittsburgh are not very rosy.

The advantages of using natural gas are not generally known. The fuel bill of a large mill at Pittsburgh prices, which are about one-half Western prices, would be nearly $200,000 per year for coal and slack, while gas ought to cost from $3,000 to $15,000. But, in reality, the gas gives the manufacturers fuel for nothing, and a cash bonus of from fifty to two hundred thousand dollars over slack and coal prices, in this way: saving about $50,000 to $100,000 per year in labor, all carting of coal, ashes, and saving in loss by oxidation of iron of from two to four per cent.—$40,000 per year in an average mill, saving fire-brick and boilers, increasing output of mill, and producing iron and steel far superior to all other. In glass it saves firing, stoking, casting, loss in glass by sulphur from coal getting in pot, necessitating skimming top and throwing away; saving in loss by cracking of pots, bricks, etc., and producing a glass that, if sold at the same price, will drive all others out of the market.



MACHINISTS' BOLT DOG.

Dakota Tin.

Harney's Peak is the highest elevation in the Black Hills, having an altitude of 7,403 feet above the sea. Here on its south-east flank, near the town of Harney, in June, 1883, the country was electrified by the discovery of cassitterite, the ore of tin, the most remarkable and important mineral discovery of modern times. For some time its genuineness was doubted, disbelieved and even ridiculed. No person of means could be induced to become interested in its development. A handful of miners alone, unaided and without capital were left to struggle with the gigantic proposition in its infancy. To the steadfast perseverance and energy of these men, Rapid City and the country are largely indebted for the present status of this great industry.

Scarcely two years have elapsed, however, since the first tin ore was taken from the little discovery hole on the Etta location and its true character became known, and more than 1,000 claims have been located, many of which are tin bearing and in process of development; the district is being constantly extended by the continued researches of the prospectors, and the Harney Peak Tin Mining, Milling and Manufacturing Company, a strong New York corporation, through its representatives, appeared upon the scene and purchased the Etta mine and other contiguous properties. This company is backed by all the capital that is necessary for the business it has undertaken. It has prosecuted developments for the past year on the mines and devoted intelligent and scientific investigation to the ores and machinery for their reduction.

The development on the Etta mine now embrace over 1,000 feet of open cut, shaft and tunnel, by which the company has placed over 40,000 tons of good paying ore "in sight" in the mine and on the dumps, estimated to the depth of 75 feet, the point of deepest exploration on the vein proper, with the probability of more than double this quantity being developed, when the lower working tunnel reaches the ore body.

This company also owns largely of mines in the vicinity of Hill City on which sufficient development has been made to place them in the front rank as tin producers.

Based on these developments, and after continued experiments with ton lots of the ore, the company is now engaged in erecting a large concentrating mill capable of handling two hundred tons per day, which will soon be followed by the construction of furnaces for reducing the concentrated ore.

The Harney Peak Tin Mining, Milling and Manufacturing Company alone, when in full operation, will give employment to more than one thousand men in opening and developing its mines, extracting ore and operating its mills and furnaces.—*Rapid City Republican.*

The Custer *Chronicle* says: The Etta Mine, three miles from Harney City, and the ledges in and near Hill City, are richly impregnated with tin, both having been extensively tested. The company has been improving its property, and will soon have a sixty-stamp mill in operation, and be prepared to handle 180 tons of ore daily. The ore from this mine will average at the mill 3 per cent. of pure tin, or three tons of metallic tin to 100 tons of ore.

The company owns over 400 acres of placer ground, containing stream tin and gold in large quantities. The stream tin averages 46 per cent. of pure metallic tin, as determined by tests made on a large scale. Already a respectable settlement has been made on the property, it consisting of the general office, storehouse and eight dwellings, including two used as boarding-houses, a laboratory, barn, shops, etc. Regarding the Etta Mine, the manager of the New York Metallurgical Works says:

"The mine has been thoroughly prospected to a depth of about 75 feet, and a tunnel, now almost completed, will develop the ore body a little over 100 feet deeper still. My lowest estimate is that the Etta, as at present shown, will yield 500 tons of 3 per cent. greissen ore for every foot of depth."—*The American Artisan and Tinner and House Furnisher.*

Machinists' Bolt Dog.

The engraving represents this device attached to the face-plate ready for use. We believe it will strike the machinist as being a very convenient and labor-saving tool. A knurled head nut and screw provides for quickly adjusting the distance between the face-plate and dog, and the jaws can be as quickly adjusted to take work from $\frac{3}{16}$ in. to $1\frac{3}{4}$ in. The manufacturers, Fay & Scott, Dexter, Maine, say of this device:

"The practice in most shops, in case a dozen more or less bolts that must be turned or threaded are wanted, is to go to the blacksmith and have a square hole, to fit these particular bolts, punched in a piece of tire iron, and then by means of some old washers and a bolt, attaching this to the lathe. And we find that this rig, by the time it is ready for work, has used up over an hour's time. Worse still, if we attempt to drive the bolt by a common dog, a little thought shows that we must tighten and loosen the screw in dog at least five times before we have the bolt finished.

"With this dog, after attaching it to the face-plate and setting the jaws the proper distance apart to fit the work, it is then simply the putting of the bolt between the centers, and it can be turned up to the head, and the head squared up to any reasonable thickness."

The Great Canals of the World.

The Imperial Canal of China is over 1,000 miles long. In the year of 1861 was completed the greatest undertaking of the kind on the European continent, the Canal of Languedoc, or the Canal du Midi, to connect the Atlantic with the Mediterranean; its length is 148 miles, it has more than 100 locks and about 50 aqueducts, and its highest part is no less than 600 feet above the sea; it is navigable for vessels of upward of 600 tons. The largest ship canal in Europe is the great North Holland Canal, completed in 1825—125 feet wide at the water surface, 31 feet wide at the bottom, and has a depth of 20 feet, it extends from Amsterdam to the Helder, 51 miles. The Caledonia Canal, in Scotland, has a total length of 60 miles, including three lakes. The Suez Canal is 88 miles long, of which 66 miles are actual canal. The Erie Canal is 350½ miles long; the Ohio Canal, Cleveland to Portsmouth, 332; the Miami and Erie, Cincinnati to Toledo, 291; the Wabash and Erie, Evansville to the Ohio line, 374.

The exhibition buildings of the Franklin Institute, 32d street and Lancaster avenue, are now open for the reception of goods for the Novelties Exhibition, which will open September 15, and close October 31. If this exhibition is carried out according to the plan announced by the management, exhibits that have done duty at industrial fairs for the last decade or more will be rigidly excluded. It is to be novelties in fact as well as in name. Merit, too, is to govern the acceptance of all articles admitted.

Visitors to exhibitions have become tired of viewing the same old displays year after year, and long to see a collection of new articles that are worth a journey to examine. It is expected that visitors will not be disappointed in this when they go to the Philadelphia Exhibition next month.

A Pittsburgh paper says: "A map of Pittsburgh under ground a year or two hence will look like a picture of a coarse wire screen." All the natural gas under and around the city is likely to be developed.

There is a well of natural gas at Murrysville, Pa., that has been flowing for ten years, and it is said there is no diminution of pressure, though as good a well has been struck within thirty feet of it.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Pres't.
JACKSON BAILEY, Vice-Pres't.
LYCURGUS B. MOORE, Treas. and Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

F. F. HEMENWAY, - - Mechanical Engineer.

The American News Company,

Publishers' Agents, New York.

The International News Company,

11 BOUVERIE STREET (Fleet Street), LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST, at 14/7 per annum, postage paid.

DEALERS SUPPLIED BY

The American News Company, New York.
The American News Company, Denver, Col.
The American News Company, Kansas City, Mo.
The American News Company, Omaha, Neb.
The American News Company, St. Paul, Minn.
The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass.
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St Louis News Company, St. Louis, Mo.
The Cincinnati News Company, Cincinnati, O.
The Detroit News Company, Detroit, Mich.
The Pittsburgh News Company, Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Company, Providence, R.I.
The San Francisco News Co., San Francisco, Cal.
The Brooklyn News Company, Brooklyn, N. Y.
The Williamsburg News Co., Brooklyn, E. D., N. Y.
The Newark News Company, Newark, N. J.
The Northern News Company, Troy, N. Y.
The Albany News Company, Albany, N. Y.
The Washington News Company, Washington, D.C.
The New Orleans News Company, New Orleans, La.
The Montreal News Company, Montreal, Canada.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

SUBSCRIPTION.

$2.50 a year in advance, postage prepaid in the United States and Canada.

$3.50 a year to Foreign Countries, postage prepaid, except Bolivia and South Africa, to which the subscription rate is $4.50 a year, postage prepaid.

ADVERTISING.

Transient, 35c. per line, each insertion.
"Business Specials," 50c. a line.

EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, SEPTEMBER 5, 1885.

CONTENTS.

PAGE

Improved Hoisting Machinery 1
What I Know About Jigs. By S. W. Goodyear. 1
New York State Apprentice Law 2
Reed's Gas Tire-Heating Machine 3
A Labor Dispute Properly Settled 3
The Development of the Connecting-Rod. By William H. Harrison 4
Faults of Boiler Tubes 4
Modern Locomotive Construction. By J. G. A. Meyer 5
Letters from Practical Men—How to Get Information in Boilermaking—Raising Water with a Siphon—Separating Brass from Wrought Scrap—Balancing the Reciprocating Parts of Steam Engines—Boring Brass Cylinders—A Defective Safety Valve—Smoke-Stacks and Spark Arresters 6
New Blacksmiths' Drills 6
Natural Gas. By J. Harmas Katz 7
Dakota Tin 7
Machinists' Bolt Dog 7
The Great Canals of the World 7
The Outlook for Business 8
A Valuable Report on Labor Statistics 8
Real engineers and Parchment Engineers 8
Congratulating Law Breakers 8
The New Exposition at New Orleans 8
Literary Notes 9
Business Specials 9
Questions and Answers 9
Manufactures 9
Machinists' Supplies and Iron 10

The Outlook for Business.

Indications of greater activity in industrial circles are multiplying. Conditions are more favorable than they were a month ago. Iron mills that have been idle are many of them starting up, and others are making improvements preparatory to starting. Merchants in the dry-goods trade and other lines report a more confident feeling among purchasers. The impression is becoming stronger that prices are as low as they are likely to be in most lines of merchandise. Large amounts of idle capital are waiting sure signs of an upward movement when it will be invested in productive and distributive enterprises. Crops are generally favorable, the railroads are doing a better business and the outlook is more encouraging.

A Valuable Report on Labor Statistics.

The recent annual report of Joel B. McCamant, chief of the Pennsylvania Bureau of Industrial Statistics is one of the most interesting volumes of the kind that has ever come to our notice. The work of gathering the facts and presenting them in his report bears evidence of being fearlessly and conscientiously done, and cannot fail to produce beneficial results. The work of the bureau is "to collect, compile and publish such statistics in regard to the wages of labor and the social condition of the laboring classes as will enable the people of the State to judge how far legislation can be invoked to correct existing evils." Mr. McCamant has discovered that where evils exist they are mostly found where laborers in large bodies are employed. Therefore he has directed his efforts mainly to the larger establishments. From statistics and reports received the following conclusions have been reached:

"That the wage-worker as a rule is frugal, temperate and industrious. The amount of wages paid do not admit of intemperate or improvident habits."

"That the present amount of wages annually paid does not give to the wage-worker comfortable means of support, and enable him to lay by even a moderate fund to meet the necessary exigencies he is almost certain to encounter."

"That wage-workers receive in wages at least one-third less than is generally accredited to them, owing to the fact that the accredited wages per diem are not the average for computation throughout the year, without due allowance is made for unemployed time. Enforced idleness is more disastrous than the nominally low rate of wages."

"That at the present time steady and certain employment is more important to the wage-worker than a nominal advance in per diem wages, and it is to be hoped that business conditions will soon be such as will insure continuous employment."

"That an average of eight hours a day is not now granted to the wage-worker. The uncertainty in the distribution of the working days is calculated to enervate the worker physically as well as mentally."

The great and growing evil of child labor cannot be prevented "until the head of the family is enabled by his own labor to earn an adequate support." It is essential to the future welfare of the State that labor should be adequately paid, for the great mass of the community is composed of wage-workers. The truth of the following statement will be generally recognized:

"The laws passed in the interest and for the protection of the wage-worker in this Commonwealth do not answer the purpose intended, for the reason that they are not generally observed. Labor suffers not so much from lack of laws for its protection as for the means of enforcing those already on the statute-books." The same is true in other States. Legislators often pass laws ostensibly for the benefit of labor, which they do not expect to have enforced. Perhaps legislative inquiries into the reason for non-enforcement of labor laws would do more good at present than the enactment of new laws. Why, for instance, is not the eight-hour law enforced on public works in this State? It is certainly not because of inability to carry out its provisions. "The non-enforcement of law," says Mr. McCamant, "is demoralizing in its tendency in lessening general respect for law. An unjust law should not be passed by the legislature, but when laws are passed they should be enforced, and if found impracticable or grinding they should be repealed."

The necessity for industrial schools is clearly pointed out in the following words:

The prizes of the future will not be for the office-holder, or the average lawyer or physician, but to those eminent in the mechanical arts and sciences. In this age of electricity, and in the demand for new and more perfect designs, a new field is being opened to the youth of the land commensurate with the aspirations of the most ambitious.

The mechanical training of our youth has become a question of vital importance. The establishment of industrial schools by the State would do much, but a thorough revision of our common school system would do more. Seven-tenths of those graduating from the common schools drift into mines, manufactories and workshops without having received an hour's instruction in mechanical drawing or the use of tools. The great mass of the people must necessarily acquire a livelihood by manual labor. The common school is for the benefit of the masses, not for the few, and the system of education should be so designed. Of what are termed the higher branches taught in our public schools, a mere smattering is acquired, and the hours devoted to the study of the classics are, for the most part, precious time wasted. How to educate our youth in the mechanical arts is a subject of vital importance and worthy of the earnest attention of the legislature.

About 65,000 workers are engaged in Pennsylvania iron and steel industries. Wages vary according to locality. Wages are higher in the Western district than in the Eastern district. "The majority of skilled wage-workers in the Western district are members of a labor organization known as the Amalgamated Steel and Iron Association."

In spite of the law against paying wages in anything but cash the truck-pay system seems to flourish in many parts of the State. The report says: "The existence of this system makes it more difficult to arrive at the real amount of wages paid to wage-workers. Operators in many instances report the amount of wages paid wage-workers as actual money paid to them, when the facts would warrant them in reporting fully two-thirds of the amount as *groceries* and *provisions* paid in lieu of money. The prices paid by the wage-worker for groceries, provisions, &c., obtained on store orders are equivalent to a reduction of from ten to fifteen per cent. of his wages. The system of 'Company Stores' robs the wage-worker of an amount of money that is impossible to calculate, but enough is known to warrant the inference that he, who forced by circumstances, is obliged to accept store orders or deal at the 'Company's Store,' is at the mercy of the employer."

Some solid arguments are adduced in favor of a strict enforcement of the law prohibiting the importation of foreign contract labor, and leading industries of the State are treated in detail. We commend a perusal of this report to all who wish to become correctly informed upon labor problems.

Real Engineers and Parchment Engineers.

For the benefit of some contemporaries who are given to sneering at everything that does not come through a technical school or college, and hence are grievously exercised at the answer to a correspondent of the AMERICAN MACHINIST, to the effect that any man who *is* a mechanical engineer has the right to describe himself as such, we say, once for all, that the title of mechanical engineer is purely a descriptive title, as much so as that of machinist or boiler-maker. The only man who is in justice entitled to write M. E. after his name unless he is a mechanical engineer, is one who has graduated from some school or college; such an one may be a mechanical engineer in fact, or by enactment only. *Real* mechanical engineers, whether graduates of schools or not, may in time feel constrained to adopt some other descriptive name—something to indicate that they are more than M. E. by title; but if they do, it will not be by virtue of any authority vested in technical schools to usurp the exclusive use of their present title. Engineers were common before the existence of schools that made them such, on parchment, and may with perfect propriety and appropriateness describe themselves as such without reference to whether they are school graduates or members of any society whatever. Being either does not make them engineers in fact, nor hinder them from being such.

Congratulating Law Breakers.

The *New York Times* which champions free trade, the prison labor contract system and the unrestricted importation of Chinese coolies and foreign white workmen to depress the rate of wages, publishes an editorial headed "A Tariff on Labor," in which it says: "We congratulate the reputable firm of Dunbar, McMasters & Co., for they have narrowly escaped possible indictment, or at the very least suit for $1,000 penalty."

Now what did this firm do to call forth the congratulation of the *Times?* They admittedly violated a United States law by importing a lot of spinners, prepaying their passage here under a contract made abroad, to work at certain wages. Through a technical error, the affidavits being sent to the Attorney-General instead of the District-Attorney, they escaped the prescribed "penalty of $1,000 for every offence" of the law which was enacted last March. The spectacle of a newspaper which is almost fanatical in its agitation for certain fine-spun "reforms" and political virtues, offering its congratulations to a firm that has successfully broken the law and dodged the penalty, is edifying, to say the least. We hope the rising generation will not select its code of ethics from the *Times*. The next thing in order—something of precisely the same nature—is for that sheet to congratulate smugglers who may have run in goods without paying duty, and have escaped the penalty through some mistake of the prosecuting officers.

The New Exposition at New Orleans.

The managers of the new Exposition at New Orleans, known as the North, Central and South American Exposition, report that there is every prospect that the Exposition will surpass that of last season, both in volume and variety of exhibits. Assurances have been received from representatives of the nations south of us that they will heartily co-operate in making the Exposition a success. The exhibits from the Argentine Confederation and from Gautemala will be especially interesting and complete. Mexico and Brazil will be well represented. The new Exposition cannot fail to cultivate more intimate trade relations between the three Americas, and result in creating new markets for the manufacturers and merchants of the United States. The great bulk of the trade of Spanish and Portuguese America is now absorbed by Europe, while the producers of the United States are suffering from a surplus production. It is believed that the new Exposition will give an impetus to commerce of lasting advantage to lla the countries on this hemisphere.

The errors of the late Exposition will, it is said, be carefully avoided by the managers of the new. The Exposition will open as nearly as possible in a state of completion, and especial attention will be paid to rates of transportation. The president of the enterprise, S. B. McConnico, is one of the most experienced and influential railroad managers in the South, and it is expected that fares to New Orleans from any part of the United States will be reduced, so that a New Yorker may go and return for $25, instead of $45, which was charged last season. It is also said that the hotels and boarding-houses of New Orleans will be much better equipped for the accommodation of guests, and a

steam railway will carry passengers from the heart of the city to the fair grounds.

The managing director for the Middle States, with office at 234 Broadway, New York, is General C. H. Barney, formerly Adjutant-General of Rhode Island.

The *Evening Post*, in noting the instance of a locomotive engineer who found himself being rapidly overcome by the heat as he was nearing the crossing of another railroad, managed to keep up until he stopped his train, just in time to prevent its dashing into another train, concludes as follows:

It speaks well for the capacity and fidelity of engineers that accidents so seldom happen which are due to any lack of care or error of judgment on their part.

This is a matter that cannot have escaped the notice of every observing person. It is not easy to recall instances where, with his train in peril, the engineer has not been equal to the emergency so far as doing all that a brave, cool man could do for its safety. The fact that by sticking to his post he is riding to almost certain death, seldom—almost literally never—interferes with what he believes to be his duty; that is to do all that can be done for the safety of the passengers. The knowledge that the man working in the heat and dust at the front, will, if occasion requires, show himself as brave and cool as any trained warrior ever did, without expectation of the warrior's reward, adds immeasurably to the comforts of railroad travel.

Literary Notes.

HANDY ESTIMATE BLANKS. Compiled and arranged by J. D. Sibley and A. O. Kittredge.

These blanks are designed to afford builders convenient forms upon which to make estimates and record the cost of work in masonry and carpentry. Under these general headings are various sub-headings, including all parts of the work necessary to construct an ordinary building. The arrangement is such that the comparison between estimated quantities and cost, and actual quantities and cost upon an entire job, or upon any part of it, is seen at a glance. We believe that these blanks will be appreciated by builders, and that their use will save many costly mistakes in making estimates. They are prepared in 28 pages, 9½x12 inches. Price, 15 cents for single copies, or $1.50 per dozen. Published by David Williams, 83 Reade street, New York.

THE PRACTICAL ESTIMATOR,

by the same authors and publisher, is a companion and key to the Handy Estimate Blanks, containing full description for their use. A complete list of items, so far as practicable, is given, and blank spaces left for entering other items peculiar to any locality. The book contains, in addition, useful rules and tables relating to building, wages, etc., etc., that greatly add to its usefulness, and make it a valuable assistant even to those who do not use the estimate blanks. The price of the book is $1.

MODERN MOULDING AND PATTERNMAKING.

A Practical Treatise Upon Pattern, Shop, and Foundry Work. Embracing the moulding of pulleys, spur gears, worm gears, balance wheels, stationary engine and locomotive cylinders, globe valves, tool work, mining machinery, screw propellers, patternshop machinery, and the latest improvements in English and American cupolas; together with a large collection of original and carefully selected rules and tables for every-day use in the drawing office, pattern-shop and foundry; with 165 illustrations. By Joseph Mullin, M. E. Published by D. Van Nostrand, 23 Murray street, and 27 Warren street, New York. Price, $2.50.

In this book, the actual experience of the writer on a large variety of work is detailed in a plain, clear, and comprehensive manner. There is nothing of a speculative character in the work. The wise conclusion of the author in this respect may be gathered from the following quotation from his preface:

"I have followed every piece in detail, from the drawing-room to the finished casting, ready for the machinist. Knowing the great expense of such work, I have not dared to give mere speculations, which might or might not be practically possible."

The rules and tables form a valuable addition to the work, which we believe will be well received, and prove a valuable addition to this class of literature.

The July, 1885, issue of "Ealy's Blue Book" marks an important advance in the progress of this very successful commercial agency business conducted by its publishers, The John W. Ealy Co., 265 Broadway, New York, and 79 Dearborn Street, Chicago. The book is enlarged to a size commensurate with the magnitude of the trades to which it relates, and to which it limits itself with the view of attaining a higher degree of efficiency than can be reached by an agency which attempts to include every branch of business. The July issue contains a total classified list of 275,000 names, including all branches of the machinery, iron, hardware and metal trades. Smaller books are also issued for pocket use applying to different States.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(255) J. S. B., Philadelphia, Pa., asks: What is meant by the pitch of boiler rivets? *A.*—The distance which they are placed apart.

(256) H. C., Toledo, Ohio, asks: In cutting a regular taper tap, should the tool be set at right angles with the surface, or at right angles with the center line of the tap? *A.*—At right angles with the center line.

(257) S. A. K., Cleveland, Ohio, asks: What part of a pound pressure per square inch is ten-tenths or seven-tenths as gas is measured? *A.*—The pressure of illuminating gas is usually reckoned by the height of a column of water in inches and fractions of an inch which the pressure will support. A column of water 27.68 inches high equals one pound per square inch, so that 10-10ths. =1 inch is 1÷27.68=.035 lb. pressure per square inch, and 7-10ths. is .035×.7=.0245 lb. per square inch.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Air Compressors, Rock Drills. J. Clayton, B'klyn, N.Y.

Curtis Pressure Regulator and St'm Trap, Aug15, p 12

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Presses & Dies, Ferracute Mach. Co, Bridgeton, N J.

Steel Name Stamps, &c. J.B.Roney, Lynn, Mass.

Treatise on gear teeth and bevel gears; specimen pp. free. Geo B. Grant, 66 Beverly st., Boston, Mass

Consulting Engineer and Mechanical Expert, C. C. Hill, 84 Market st., Chicago, Ill.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st, New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts, New York.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John st., N. Y.

Improved Labor-Saving Upright Drills; prices reasonable. Currier & Snyder, Worcester, Mass.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Lathe tools, improved threading tools, cutting-off tools. Catalogue sent. H'tf'd Tool Co., Hartford, Ct.

Upright power hammers, unequaled for die work run at high speed. Williams, White & Co., Moline, Ill.

Selden Packing for stuffing box, with or without rubber core Randolph Brandt, 38 Cortlandt st., N.Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Farley's Reference Directory of the Machinists', Iron, Steel and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N.Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Wanted.—Mechanical Automatic Figures. Must be new and *original* design, and *work naturally*. Address, with full description and price, Lock Box B, Waterbury, Conn.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass.

Locomotive Engine Running and Management. By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent on orders for five or more copies.

Manufactures.

Work has begun on the new steel plant at Pottsville, Pa.

Clark & Adams are building a machine shop at Elberton, Ga.

A project is on foot to build a car-wheel foundry at Denison, Texas.

The Standard Silk Mill Co., of Phillipsburg, N. J., will erect a building.

An addition is to be built to the Perkins Foundry at Port Jackson, N. Y.

Hegewald & Co., New Albany, Ind., will erect boiler and sheet-iron works.

The Pennsylvania Hoop Dressing Company, Williamsport, Pa, will erect works to cost $90,000.

Charlestown, W. Va., has appointed a committee to inquire into the cost of building water-works.

The water-works, Fort Worth, Texas, are to be enlarged and new machinery, boilers, etc., added.

The Greenfield (Mass.) Co operative Cutlery Co., is to be reorganized and started upon a new basis.

E F. Joyce has completed a building in St. Augustine, Fla., where he will shortly put in machinery for manufacturing ice from pure artesian water.

John Graham, 354 West 33d street, New York, will erect a brick factory for light manufacturing, to cost $16,000.

Wellsboro, Pa., is to have a system of water-works, for which $50,000 of the needed capital has already been subscribed.

The Curtis Regulator Company has just finished a large pressure regulator for the water-works of the city of Moscow, Russia.

The Eureka Chemical Works, Watertown, N. Y., will erect a factory for the manufacture of chemcals. E. Dewey, President.

The H C. Frick Coke Company, of Pittsburgh, Pa, intend to have several light locomotives built for use in their coke yards for shifting cars.

The Campbell Manufacturing Company's Foundry, River avenue, Allegheny, Pa, recently destroyed by fire, will be rebuilt at once of brick.

It is reported that the Dayton Coal and Iron Works, of Dayton, Tenn., will erect a steel plant as soon as they have completed their furnaces.

Several large iron-mills in the West, which have been idle, have resumed operations. Some thousands of idle men are thereby given employment.

The Coweta Fertilizer Co., Newnan, Ga., has been incorporated, the capital stock, $20,000, having been all subscribed; will erect a fertilizer factory.

The Akron Twine and Cordage Company, of Akron, Ohio, recently incorporated, are erecting buildings, and expect to employ from 200 to 300 hands.

S. H. Barrett and others, of Springfield, Mass. have formed the Barrett Mfg. Co, to make the Barrett anti-friction roller bearing. The company expect to start a shop.

The water commissioners of Batavia, N. Y., have awarded the contract for the entire work of enlarging and extending the water-works to the Holly Mfg. Co., Lockport, N. Y.

The Millerton Iron Co. is about to build a new blast furnace at Millerton, Duchess County, N. Y. The furnace will be 50 feet high, and 9 feet 6 inches bosh, and will use charcoal as fuel.

The Southern Machine Co, Shelbyville, Tenn., inform us that their plant is now in, and doing all the work it can with fifteen hands and a capital of $25,000, and that there is every prospect of success.

The double drum sand-papering machine made by the Egan Co., of Cincinnati, seems to be meeting with favor. They have several testimonials as to its value as a labor saver.

Ellis & Lessig, Pottstown, Pa., have notified their heaters, helpers, rollers, and other men in their mills, that their wages will be increased, the increase, in some cases, reaching as much as twenty per cent., with a prospect of the mill running on double time.

The Boston Manufacturing Company, of Waltham, Mass., stopped operations in its cotton mill Aug. 18, for an indefinite period, throwing 600 men out of employment. The Waltham Watch Tool Company also closed its shop, throwing 60 men out of employment,

Dr. Lancaster, of Augusta, Me., has invented a new wrench, said to possess many advantages that commend it to mechanics. A company has been formed, with R. W. Soule, of Augusta, as general manager, and it is proposed to commence their manufacture in that city.

The five furnaces in the plate mill of the Pottstown Iron Company, in Pottstown, Pa., which had been idle for some time, started Aug. 18. Arrangements are also being made to put the new Universal mill in operation. The outlook in the iron trade is said to be much more favorable than it has been for years.

Reed Brothers, tack manufacturers, Brockton, Mass., have staked out a lot near their tack factory upon which they will erect a large rolling mill, to take the place of one which they now conduct at Matfield. It will be fitted with the latest machinery for the purpose, and will be one of the largest iron rolling mills in the section.

The manufacturing of the new grooved dowel-pin, just started at Battle Creek, Mich., by Charles Robinson and Ralph H. Alward, two young men, is proving a great success, and will help to give Battle Creek another boom. The furniture manufacturers of Cincinnati alone want 15,000,000 dowel-pins annually.—*Grand Rapids Morning Telegram.*

Lodge, Barker & Co., Cincinnati, Ohio, have issued a neat 42-page illustrated catalogue of their machine tools, including engine, turret, and hand-lathes, shapers, and valve milling machines. These tools are becoming well known in the East, as well as in the West. They are well represented and described in the catalogue, which will be mailed to any one upon application.

The Hartford Tool Company, Hartford, Conn., have issued a new illustrated catalogue of their thread-cutting, turning, boring, gauging and improved machinists' tools in general. These tools greatly facilitate shop work. They also make to order all kinds of small special tools for machinists. The catalogue is pocket size, and will be mailed to any machinist upon request.

C. Townsend, superintendent of the Beaufort Mills (machinists and boilermakers), Beaufort, S.C., writes us: "Please accept our thanks for your notice of our new enterprise. The best proof we could have of the extensive circulation of your paper lies in the fact that since you first spoke of our shops we have received from ten to fifteen letters or circulars by each mail. I have been a regular subscriber to your paper (through local agents) since I first saw it several years since, and consider it the only *mechanic's* paper I have ever read—not theory, but practice."

The Ferracute Machine Co., Bridgeton, N. J., write us: "Our new power punching presses are meeting with all the success which we anticipated from the many valuable features embodied in their construction. The No. 53 of this series has earned for us the first-class gold medal at the New Orleans Exposition, whilst the first few punching presses of this class that we have sent out to customers have been followed up by highly complimentary reports (unsolicited), as to their great efficiency and convenience. We are quite busy in all our departments. Orders come in from all parts of the United States and Canada, and recently we have received some rather large ones from Australia. Aside from our regular presses and dies, we are at present building a number of special machines for various purposes. We have just shipped 17 of our patent oil-can soldering machines to various branches of the Standard Oil Company. The outlook in general is promising."

The New York Engineering Co., 64 Cortlandt st., N. Y. City, have been selling a surprising number of the Davey Safety Engines. They have hardly as yet come up to their orders. They took their sample four times out of their store to appease customers. Among the parties with whom they have placed the Davey, are the following: Uptown News Co, 1164 N. 3d ave., N.Y. City; Magic Starch Co., 112 Warren st, N. Y. City; Hoffschmidt Bros., 272 Greenwich st., N. Y City; T. E. Winebreuer, 110 N. 4th st., Phila., Pa; Kitchen & Bounds, 735 Sansom st, Phila., Pa.; Mr. Klingenhaffer, 25th st. and Jefferson, Philadelphia, Pa.; A Geutsch, 126 N. 4th st., Phila., Pa; A. D. Rowe, Holyoke, Mass.; N. Y. Exhaust Ventilator Co, at Elizabeth, N. J.; D. H. Homans, Dorchester, Mass.; Atwell, King & Co., Victoria, B. C. They are now, however, able to deliver within a reasonable time, and expect to have a very busy fall. This company are also agents for the National Water Tube Safety Boiler (Moore System), and have placed 200 H.P. in the large building owned by Mr. Henry Welch, N. Y., fronting on Greenwich st., and occupying the block between Desbrosses and Laight sts. The Leesport Iron Co., of Pennsylvania, are placing 150 H P. of the same boilers.

Machinists' Supplies and Iron.

NEW YORK, Aug. 20, 1885.

Manufacturing and supply business continue substantially the same from week to week. In rolling mills and various other lines of trade and manufacture there is evidence of improvement that must eventually be felt in all branches.

Iron—There has been no perceptible improvement in the demand for American pig. The inclination of furnacemen to reduce stock by making concessions to buyers is still apparent, but at these concessions consumers are not inclined to buy in advance of immediate wants. In the Western markets there is a little better feeling in regard to future prospects. We quote standard brands of No. 1 X Foundry at $17.50 to $18, with some sales of sound lots at $17; No 2 Foundry, $15.50 to $16; Grey Forge, $13.50 to $14.50, at furnace.

Scotch Pig—Transactions are only in small lots, and usually at concessions from quoted prices. Shotts is held at $19.50 to $20; Coltness, $19.50 to $20; Glengarnock, $18.50 to $19; Gartsherrie, $19 to $19.50.

Copper—The demand continues moderate, with quotations of 11⅝c. to 11¼c. for Lake, and 10¼c. to 10¾c. for other brands; a little less is bid by buyers.

Lead—Dealers hold firm for 4.30c. and upwards, with bids at 4.25c.

✻WANTED✻

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Engagement wanted by an experienced engineer and draftsman. Address J. H., AM. MACHINIST.

Wanted—Situation as foundry supt. or foreman. Best reference. Address Founder, AM. MACHINIST.

Mech. engineer and draftsman, of long experience, well recommended, wants a situation. R. G., 448 E. 58th street, New York.

Machinist desires position in some progressive or wide-awake toolroom.; correspondence solicited. Address Box 379, Waynesboro, Franklin Co, Pa.

Mechanical engineer and draftsman of experience in designing and constructing engines and machinery, wants engagement. Address Box 387, Hartford, Conn.

Wanted—A wheelwright to take charge of the boiler, shafting, etc., of a country manufacturing establishment. Must have had experience in the general repair of buildings, etc, and be able to superintend. Address Wheelwright, AM. MACHINIST.

Wanted—By practical mechanic, designer and draftsman, position as supt. or foreman of machine works; have had large experience handling men and systematizing work; best references given; c'rresp'ce solicited. Address Box 486, Waterbury, Ct.

Wanted—Situation as draftsman, machinist, or moulder in a go-ahead firm, by one who has served an apprenticeship in a leading agricultural engineering works in England, and received a fair technical education in Germany. Address W. W., Post-office, Chicago.

Wanted—Position as manager, superintendent or designer, by mechanical engineer, who has had many years' experience on hoisting, pumping and stationary engines, air compressors, mining machinery and refrigerating machines; best references. Address Box 9, AM. MACHINIST.

Wanted—Situation by an engineer of twelve years' practical experience on large condensing engines; thoroughly familiar with the indicator and other modern instruments; been over 5 years with present employers in one of the largest and best mills in the country; United States license, and good references; steamboat preferred. Address O. N. F., AM. MACHINIST.

✻ MISCELLANEOUS WANTS ✻

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Compound; ever reliable, never failing. Crescent Mfg. Co., Cleveland, Ohio.

To make room for larger tool, will sell cheap, for cash, a planer 42"x42"x12', in good order. Address P. O. Box 2085, Bridgeport, Conn.

Models and small machine work of all kinds, promptly executed at most reasonable prices. Pennington & Mills, 8 Dey st., Jersey City H'ts, N.J.

For Sale Cheap—Two 13"x5' P. & Whitney rod-feed lathes; one 20"x8' Putnam lathe; one 20"x10' Star—with chuck—lathe; 1 each Lewis, Chapin, and National bolt-headers; 1 double National bolt cutter; 1 Schlencker bolt-cutter; 1 Smith car mortiser—boring attachments; all nearly new, and first-class; send for catalogue and prices. W. H. Robertson, 28 South Canal street, Chicago, Ill.

251 *pages*, 6 *plates*, 58 *illustrations*, 8 *vo*, *cloth*. $5.00.

TREATISE ON

VALVE-GEARS

WITH SPECIAL CONSIDERATION OF THE

LINK-MOTIONS OF LOCOMOTIVE ENGINES,

BY DR. GUSTAV ZEUNER.

Translated from the fourth German edition.

BY PROF. J. F. KLEIN.

E. & F. N. SPON, 35 Murray St., New York.

FOR SALE AT A BARGAIN.

A well established and good paying machine shop and foundry, including buildings, lots, machinery and stock, situated in Leadville, Col. The business will be carried on until sold, thus at once giving a profitable trade to the purchaser. Address,

A. FALKENAU,

Care of Dickson Mfg. Co.,

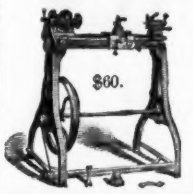
Scranton, Pa.

Only reason for selling, ill health.

CHANDLER & FARQUHAR,

177 & 179 Washington St.,

BOSTON, MASS.



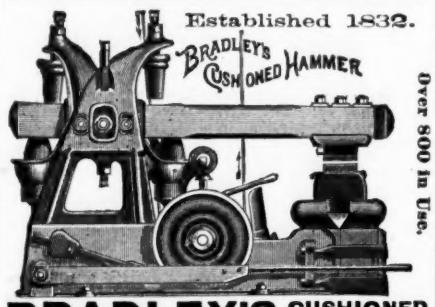
TOOLS AND SUPPLIES

—FOR—

Machinists, Plumbers, Gas Fitters, Electricians, Model Makers, Roller Skate Makers, Amateurs, etc.

Send for Catalogue B.

Established 1832.



Over 800 in Use.

BRADLEY'S CUSHIONED HAMMER.

Stands to-day without an Equal.

It approaches nearer the action of the Smith's Arm than any Hammer in the WORLD.

SPECIAL NOTICE.

All parties making, selling or using an Upright or Helve Power Hammer having a Cushioned Vibrating Saddle, infringe our patents, and we shall hold them legally liable for the same.

BRADLEY & COMPANY. Syracuse, N. Y.

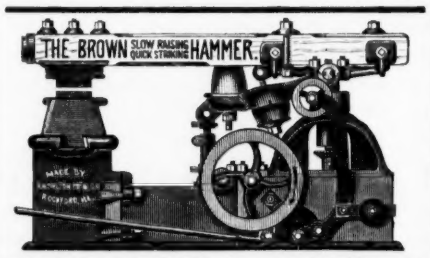
SEBASTIAN, MAY & COMPANY'S

Improved Screw Cutting

Foot or Power Lathes

Catalogue of Lathes, Drill Presses and Machinists' Tools and Supplies mailed on application. **Lathes on Trial.**

167 W. Second St., Cincinnati, O



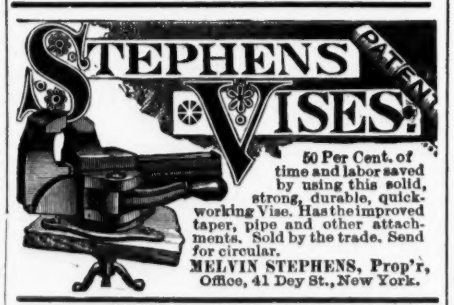
THE BROWN HAMMER

STRIKES A BLOW WITH

DOUBLE THE VELOCITY That it Raises the Hammer.

A NEW MOVEMENT! SEND FOR DESCRIPTION.

KNOWLTON MFG. CO., King St., Rockford, Ill



50 Per Cent. of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the improved taper, pipe and other attachments. Sold by the trade. Send for circular.

MELVIN STEPHENS, Prop'r, Office, 41 Dey St., New York.

JUST PUBLISHED.

One Volume, Crown 8 vo, 266 pages, 165 illustrations. Fine Cloth Binding. $2.50.

MODERN MOULDING & PATTERN-MAKING.

A Practical Treatise upon Pattern-Shop and Foundry Work,

EMBRACING THE

Moulding of Pulleys, Spur Gears, Worm Gears, Balance-Wheels, Stationary-Engine and Locomotive Cylinders, Globe Valves, Tool Work, Mining Machinery, Screw Propellers, Pattern-Shop Machinery, and the latest Improvements in English and American Cupolas.

Together with a large collection of Original and Carefully selected Rules and Tables for Every-day Use in the Drawing-office, Pattern-Shop and Foundry.

BY JOSEPH P. MULLIN, M.E.

D. VAN NOSTRAND, Publisher,

23 Murray and 27 Warren Streets.

*** Copies sent by mail on receipt of price.

THE DEANE STEAM PUMP CO.,

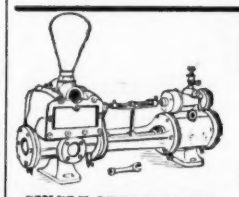
HOLYOKE, MASS.,

NEW YORK, BOSTON, CHICAGO, PHILADELPHIA AND ST. LOUIS.

Send for New Illustrated Catalogue, No. 18.

DELAMATER STEAM PUMPS

FOR ALL KINDS OF SERVICE.



SINGLE STEAM PUMP.

Manufactured by **C. H. DELAMATER & CO.,** (Delamater Iron Works)

Warerooms, 16 Cortlandt Street, New York.

BEAUDRY'S UPRIGHT HAMMER

Has no Shaky WOODEN HELVE.

Springs of Best Rubber.

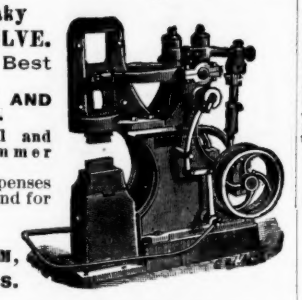
BLOW, TRUE AND ELASTIC.

Most practical and economical hammer made.

Will reduce expenses of any shop. Send for description.

BEAUDRY & CUNNINGHAM,

BOSTON, MASS.



JUST PUBLISHED.

GAS ENGINES,

BY WILLIAM MACGREGOR.

12 mo, 231 pages, with seven large folding plates, containing 75 illustrations. Price, $3.00.

This is the first English work containing a popular treatment of the principles involved in that exceedingly useful commercial motor, the Gas Engine. All the principal engines before the public are described, and the differences of construction pointed out. Those historical gas motors that have led to the present development of the engine are dealt with according to their merit. Also the users of Gas Engines will find valuable information as to the management of these motors.

D. VAN NOSTRAND, Publisher,

23 Murray and 27 Warren Sts., N.Y.

*** Copies sent by mail on receipt of price.

GUILD & GARRISON,

BROOKLYN, N. Y.

STEAM PUMPS,

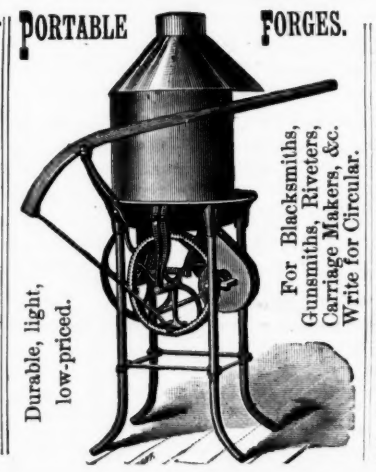
VACUUM PUMPS,

AIR COMPRESSORS.

SEND FOR CATALOGUE.

COOKE & COMP'Y,

PORTABLE FORGES.



Durable, light, low-priced.

For Blacksmiths, Gunsmiths, Riveters, Carriage Makers, &c. Write for Circular.

22 CORTLANDT STREET, NEW YORK.

Horse Shoe Nail Factory For Sale.

The St. Lawrence Horse Shoe Nail Factory, consisting of a three-story building connected with a good and exclusive water power, situated at Brasher's Falls, St. Lawrence county, N. Y., on the line of the Ogdensburg and Lake Champlain Railroad, is offered for sale at a bargain, together with complete machinery for the manufacture of horse shoe nails, consisting of two of the latest improved Dodge Machines, a Woodruff Pointer and all the latest improved shafting and other machinery necessary for the complete equipment of the business.

Owing to litigation entirely disconnected with the business, this property has fallen into the hands of a lady who desires to dispose of it at once.

For terms and particulars, address, or apply to,

O'BRIEN, EMERSON & WARD,

Watertown, N. Y.

THE CAMERON STEAM PUMP.

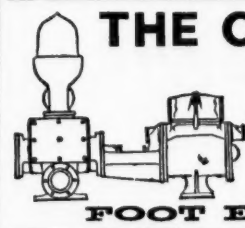
STANDARD OF EXCELLENCE.

30,000 IN USE.

MANUFACTURED SOLELY BY

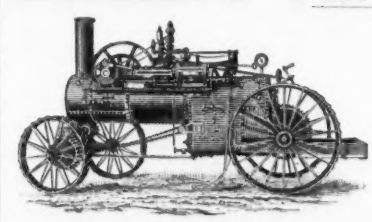
The A. S. Cameron Steam Pump Works,

FOOT EAST 23d ST., NEW YORK.



1852 — 1885

—THE LATEST— IMPROVEMENT IN TRACTION ENGINES.



The only Engine where the power is practically and successfully applied to the four truck wheels. Exceeds all other Traction Engines in pulling and steering through mud holes, sand or any soft or uneven ground, or on any road. Is the result accumulated from a third of a century of study and practical experience in the manufacture of

Portable, Agricultural and Stationary Steam Engines,

With determined policy to build only the BEST MACHINERY from the BEST MATERIALS, and in the BEST MANNER OF CONSTRUCTION, and with continued improvements, have attained the HIGHEST STANDARD in excellence of workmanship, simplicity of design and capacity of power.

In addition to our STANDARD ENGINES, we now offer the first ROAD ENGINE which has the Traction Power practically and efficiently applied to the four truck wheels, and while so applied to each wheel independently, the forward axle is under full control of the steering apparatus. Descriptive catalogue will be sent on application.

WOOD, TABER & MORSE, Eaton, Madison County, N. Y.

THE HENDEY MACHINE COMPANY,

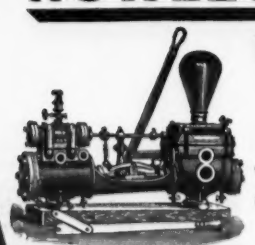
TORRINGTON, CONN.,

MANUFACTURERS OF

MACHINISTS' TOOLS.

Planers, Shapers, Gang Drills, Rivet Machines, Turret Lathes, Hand Lathes, Chucking Lathes, Gang Slitters, Hand and Power Planers, Planer Centers, Shaper Centers, Slide Rests, &c.

KNOWLES PATENT STEAM PUMP



THE STANDARD.

THE BEST MADE PUMP.

THE BEST PUMP MADE.

Estimates furnished on application for Pumping Machinery of any capacity, and to work against any pressure. Air Pumps and Condensers for steam engines a specialty. Will save from 20 to 30 per cent. fuel.

SEND FOR ILLUSTRATED CATALOGUE.

ADDRESS,

93 Liberty Street, New York. KNOWLES STEAM PUMP WORKS. 44 Washington St. Boston, Mass.

H. W. JOHNS'

ASBESTOS

Roofing, Building Felt, Steam Packings, Boiler Coverings, Fire Proof Paints, Cements, Etc.

Samples and Descriptive Price Lists Free.

H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y.

175 Randolph St., Chicago; 170 N. 4th St., Philadelphia.

BETTS MACHINE CO.

WILMINGTON, DEL.

MAKERS OF HEAVY MACHINE TOOLS STANDARD GAUGES &c.

NICHOLSON FILE CO.,

SOLE MANUFACTURERS OF

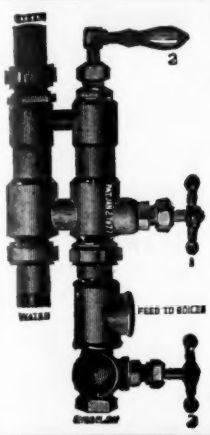
FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS AND SPECIALTIES.

"Nicholson File Co's" Files and Rasps, "Double Ender" Saw Files, "Slim" Saw Files, "Racer" Horse Rasps, Handled Rifflers, Machinists' Scrapers, File Brushes, File Cards, Surface File Holders, Vise File Holders, Stub Files and Holders, Improved Butchers' Steels.

Manufactory and Offices at PROVIDENCE, R. I., U. S. A.



THE HANCOCK INSPIRATOR.

THE STANDARD

BOILER FEEDER FOR ALL CLASSES OF BOILERS.

OVER 70,000 IN USE.

Send for Circulars and Price Lists.

THE HANCOCK INSPIRATOR CO.,

OFFICE, 33 INDIA WHARF, BOSTON, MASS.

Established in 1874.

CLEVELAND TWIST DRILL CO.

24 and 26 West Street, Cleveland, O.
101 Chambers Street, New York.
85 Queen Victoria St., London, Eng.

DIXON'S GRAPHITE GREASE

IT is the best material for coating Wire Rope that can be applied to it. The rope will last twice as long. It is also specially prepared for wagon axles and machinery bearings. It is absolutely unsurpassed as a Lubricant, and is backed by unquestionable testimonials.

SEND FOR CIRCULARS, ETC.

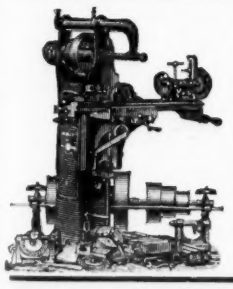
JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

CYLINDER FREE OF ACID.

Boxes of 25, 50 and 100lbs.

LINDLEY M. ELKINTON,
Manufacturer,
532 St. John Street.
Philadelphia, Pa.

TALLOW.



Contracts solicited for Special Machines, Patent Devices, &c., in quantity.

Complete outfit for Machinists, Blacksmiths, Metal-Workers and others.

New Circular on Milling Machine and Universal Head (Pat. pending).

The Cincinnati Screw & Tap Co.,
S.E. Cor. Pearl & Plum Streets,
CINCINNATI, OHIO.

THE NATIONAL FEED WATER HEATER

A brass coil heater supplying feed water at 210° to 212° Fahrenheit by use of exhaust steam.

Our prices are low and reasonable, and we aim to supply the *cheapest, best and most effective Heater in the market.* Fifteen sizes. No. 1, 8-horse Heater, $17. No. 10, 100-horse Heater, $150. Iron, Brass and Copper Coils and Bends made to order. Circulars and price lists sent on application.

National Pipe Bending Co.,
NEW HAVEN,
Connecticut.

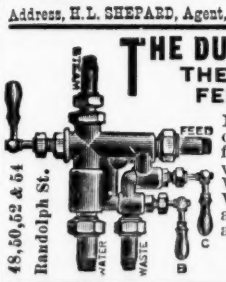
SHEPARD'S NEW $60 SCREW-CUTTING FOOT LATHE.

Foot and Power Lathes, Drill Presses, Scroll Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc.

Lathes on trial, Lathes on payment.

Send for Catalogue of outfits for amateurs or artisans.

Address, H. L. SHEPARD, Agent, 134 E. Second St., Cincinnati, O.



THE DUPLEX INJECTOR
THE BEST BOILER FEEDER KNOWN.

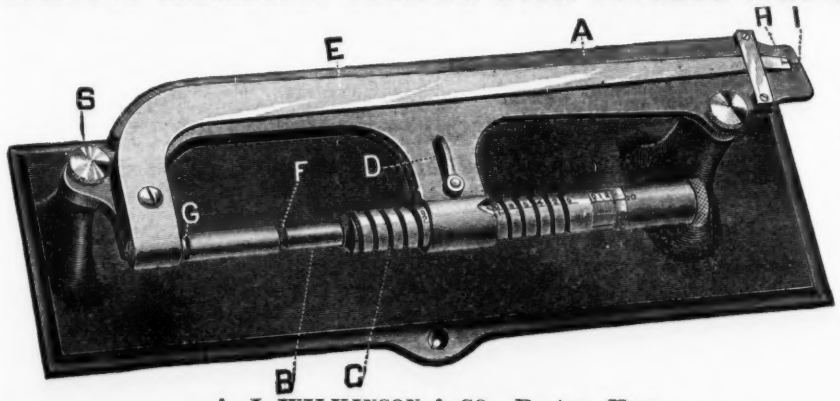
Not liable to get out of order. Will lift water 25 feet. Always delivers water *hot* to the boiler. Will start when it is hot. Will feed water through a heater. Manufactured and for sale by

JAMES JENKS & CO.,
Detroit, Mich.

46, 50, 52 & 54 Randolph St.

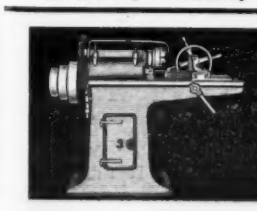
VOLNEY W. MASON & CO.,
Friction Pulleys, Clutches and Elevators,
PROVIDENCE, R. I.

IMPROVED INDICATING CALIPER WITH COVERED SCREW.



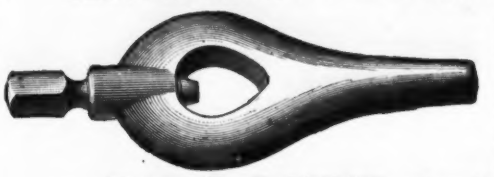
A. J. WILKINSON & CO., Boston, Mass.

Makers of the Improved Indicating Caliper, designed and used as a STANDARD TEST GAUGE in GUN, PISTOL, WATCH FACTORIES, &C. Send for Illustrated Catalogue.



ADAMS & PRICE MACHINERY CO.
SOLE MANUFACTURERS OF THE
NEW AND IMPROVED PRINCIPLE
ADAMS PATENT AUTOMATIC
BOLT AND NUT THREADING MACHINES
35 TO 41 INDIANA ST. CHICAGO.
SEND FOR ILLUSTRATED & DESCRIPTIVE CATALOGUE.

REDUCED PRICES OF LeCOUNT'S STRAIGHT TAIL DOG.



To be driven from a Stud in the Face Plate.

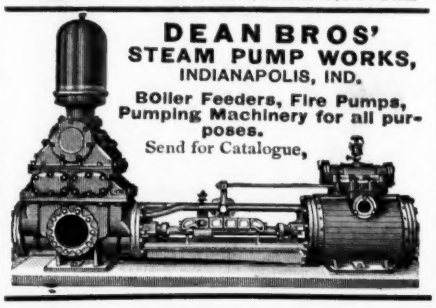
No.	INCH.	PRICE.	No.	INCH.	PRICE
1	¾	$0.60	10	2¼	$1.35
2	⅞	.70	11	2½	1.45
3	1	.70	12	3	1.60
4	1¼	.80	13	3½	1.80
5	1¼	.80	14	4	2.10
6	1⅜	.95	15	4½	2.75
7	1½	.95	16	5	3.25
8	1¾	1.10	17	5½	4.00
9	2	1.20	18	6	5.00
1 Set to 2 in.		7.80	Full Set		31.10

C. W. LeCOUNT, South Norwalk, Conn.

THE NEW PULSOMETER.

The cheapest, strongest, most simple, compact, durable, effective and economical Steam Pump in the market, for raising liquids under and up to 100 feet. No Machinery, No Oil, No Special Care. Can be worked suspended by a chain. Will pass grit, mud, sand, pulp, etc., without injury to its parts. Needs only a steam pipe from boiler to run it. Price, 600 gallons per hour, $50; 1,200 do. $75; 3,600 do. $100; 6,000 do. $150; 10,000 do. $175; 18,000 do. $225; 25,000 do. $275; 45,000 do. $400; 60,000 do. $500; 120,000 do. $1,000.

Write for illustrated descriptive book with testimonials, etc. Mailed free. PULSOMETER STEAM PUMP CO., 83 John St., New York.



DEAN BROS'
STEAM PUMP WORKS,
INDIANAPOLIS, IND.

Boiler Feeders, Fire Pumps, Pumping Machinery for all purposes.

Send for Catalogue,

"Ealy's Blue Book."

SPECIAL MERCANTILE AGENCY

DEVOTED EXCLUSIVELY TO THE

MACHINERY, HARDWARE, IRON AND METAL TRADES,

INCLUDING

Railway, Machinists', Engine and Boiler Makers' Supplies, Agricultural Implements, Stoves, Tinware, Plumbers', Steam and Gas Fitters' Supplies, Foundries, Wagon and Carriage Makers, Cutlery, Guns, and all Manufacturers, Dealers and Workers in Iron and Metals Generally.

The FIFTEENTH volume of Ealy's Blue Book is issued, containing the names and mercantile ratings of 275,000 manufacturers and dealers in above specified lines.

Our OFFICIAL RECORDS are carefully revised by a large staff of travelers and by correspondents stationed in every town in the country. Our REPORTS are also freely corrected by our subscribers, who take a personal interest in this business, which is exclusively devoted to their interests.

We refer to any prominent house in any line we represent as to our usefulness and ability.

Terms can be learned on application at our office, and a copy of our Register will be sent prepaid to any house desiring to examine it.

THE JNO. W. EALY COMPANY,

265 Broadway, New York,

79 Dearborn St., Chicago.

The M. T. Davidson Improved Steam Pump,

MANUFACTURED BY

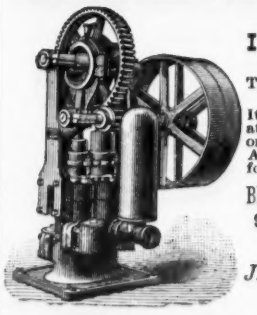
DAVIDSON STEAM PUMP COMPANY.

Warranted the BEST PUMP made for all situations.

PHILADELPHIA AGENT: DANIEL KELLY, 51 N. Seventh St.

Principal Office, 77 Liberty St., New York.

THE ECONOMIC PATENT BOILER FEED PUMP,



Manufactured by
I. B. DAVIS & SON,
Hartford, Conn.

The Only Double-Acting Geared Pump.

It is compact and Systematic in design and Economical in its operation. All its parts are arranged for durability.

BENJ. F. KELLEY, Agent,
91 Liberty St., New York.

Philadelphia Office:
JAMES BERRYMAN,
125 North Fourth St.

CORNELL UNIVERSITY,

COURSES LEADING TO DEGREES:

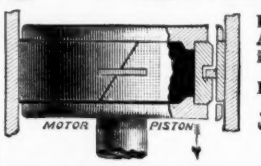
Mechanical, Engineering,
Mathematics, Civil Engineering,
Electrical Engineering, Architecture,
Agriculture, Arts, Analytical Chemistry,
Chemistry and Physics,
History and Political Science,
Literature, Natural History,
Philosophy, Science,
Science and Letters.

ENTRANCE EXAMINATIONS BEGIN AT 9 A.M. JUNE 15th, AND SEPT. 15th, 1885.

For the "UNIVERSITY REGISTER," giving full information respecting *Admission, Free Scholarships, Fellowships, Expenses, etc.*, address,

TREASURER OF CORNELL UNIVERSITY, ITHACA, N.Y.

BRANDON'S IMPROVED PISTON RING PACKING.



For Description see AMERICAN MACHINIST, issue Aug. 8th, 1885.

RIGHTS FOR SALE.

JAS. BRANDON,
233 Tenth Ave., N.Y.

FORBES & CURTIS,

BRIDGEPORT, CONN.

Manufacturers of

The Forbes Pat. Die Stocks,

Power Pipe Cutting and Threading Machines, Cutting-off Machines, Ratchet Drills, Special Machinery, etc., etc.

WRITE FOR CATALOGUE.
Mention Paper.

BEVEL GEARS,

Cut Theoretically Correct.

For particulars and estimates apply to

BREHMER BROS.,
Machinists,
440 N. 12th St., Philadelphia, Pa.

American Twist Drill Company's

PATENT CHUCK JAWS.

8 sizes. Price per set of 4 Jaws, $40, $48, $56. Bolted to lathe face plates, they make best and cheapest chuck in the world. Address orders

HILL, CLARKE & CO., Boston and St. Louis.
MANNING, MAXWELL & MOORE, N. Y. City.
TALLMAN & McFADDEN, Philadelphia, Pa.
WM. BINGHAM & CO., Cleveland, Ohio.

WATER WORKS MACHINERY

A SPECIALTY.

Cor'sp'd'ce Solicited. POND ENGINEERING CO. St. Louis, Mo.

Buffalo Cupola & Forge Blowers.

Warranted superior to any other make.

All sizes and styles of every class of work.

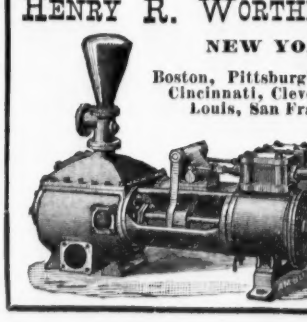
BUFFALO FORGE CO.
Buffalo, N. Y.

Send for Catalogue and prices.

WORTHINGTON PUMPING MACHINERY

HENRY R. WORTHINGTON,
NEW YORK,

Boston, Pittsburgh, Chicago, Cincinnati, Cleveland, St. Louis, San Francisco.



SEND FOR Illustrated Catalogue.

ABSOLUTELY SAFE FROM DESTRUCTIVE EXPLOSION

BOILERS

DURABLE ECONOMICAL DRY STEAM MERITS PROVEN 18 YEARS RECORD

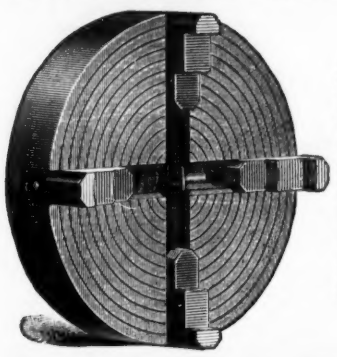
BOILERS READILY ENLARGED. STATIONARY OR PORTABLE. IMMEDIATE DELIVERY.

CORRESPONDENCE SOLICITED. HARRISON SAFETY BOILER WORKS. GERMANTOWN JUNC. PHILA. PENNA.

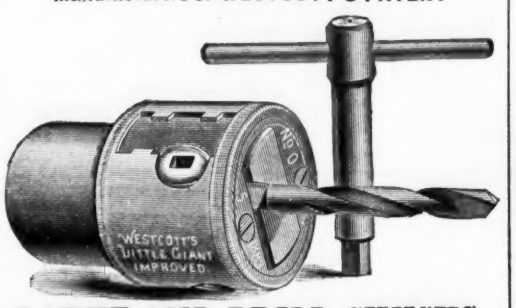
GENERAL AGENTS GRAYDON & DENTON MFG.CO. No.15 CORTLANDT ST. NEW YORK.

ONEIDA STEAM ENGINE AND FOUNDRY CO., ONEIDA, N. Y.

Manufacturers of WESTCOTT'S PATENT



NEW CATALOGUE READY.



LATHE AND DRILL CHUCKS.

Iron Planers AND Shapers.

SUPERIOR DESIGN AND WORKMANSHIP.

ROCHESTER MACHINE TOOL WORKS, Lim.

ROCHESTER, N. Y.

"EUREKA PACKING"

79 Adams St., Brooklyn, May 26, 1885.

Messrs. Hine & Robertson,

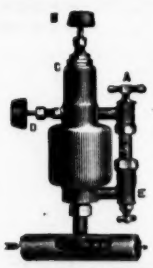
12 Cortlandt St., N.Y.

The "Eureka" Packing sent us has given the very best satisfaction, where many other kinds have failed. Our engine has been running twenty-seven years, and the rod is quite out of line, and the "Eureka" Packing seems to adjust itself to those circumstances, fully carrying out what is claimed for it, that the Flat Gum Core does the work. Please send us some ¼" for our valve stems.

A. B. SEE & CO.

*** Send also to HINE & ROBERTSON, 12 Cortlandt Street, N. Y., Sole Sales Agents, for circulars describing Kellam's Steam Damper and Pressure Regulators.

CRAIC'S New "Class C" Lubricator



Manufactured by

The Craig Sight Feed Lubricating Co.

LAWRENCE, MASS.

Manufacturers of

Sight Feed Lubricators for Locomotives, Stationary, Marine, Portable & Pumping Engines.

WRITE FOR CIRCULAR.

THE

Slate Sensitive Drill

Adapted to rapid work with small drills. Its extreme sensitiveness prevents clogging and breakage of drills. Has a swinging table with attachment for center drilling. Instantly adjustable to different lengths of work. Over 200 already in use. Send for Circular.

DWIGHT SLATE,

Hartford, Conn.

—THE—

Hartford Drill Chuck

contains the maximum of power, durability and efficiency, and is fully guaranteed. No. 1 holds from 0 to ⅛", price $7. No. 2 (round body) holds from 0 to ¾", price $8. Sold by the trade

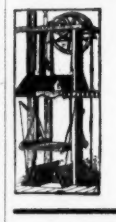
Address,

A. F. CUSHMAN,

HARTFORD, CONN.

Manufacturer of all kinds of Chucks

Send for new Illus'd Catalogue



ELEVATORS

With Screw or Spur Gear, operated with belts or hand; Automatic Hatch Doors; Hydraulic or Steam Elevators or Hoists.

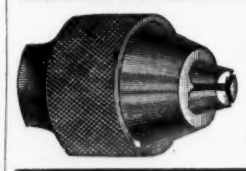
GEO. C. HOWARD,

19 S. 18th St., Phila. 12 Cortlandt St., N.Y

WHITNEY'S NEW RATCHET.

Has greater range than any two ratchets made, and at the price of one. Send for circulars.

VARIETY MACHINE CO., Warsaw, N. Y.



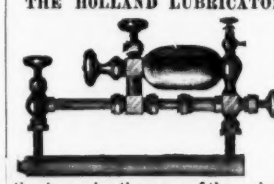
Almond Drill Chuck

Sold at all Machinists' Supply Stores.

T. R. ALMOND,

83 & 85 Washington St., Brooklyn, N. Y.

THE HOLLAND LUBRICATOR VISIBLE DROP



Is guaranteed to be:

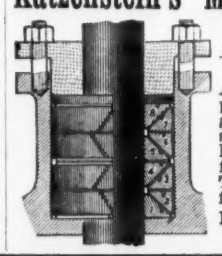
1. A perfect insurance against the cutting of Valve-seats, Cylinder, and Governor Valves of the engine.
2. It will pay for itself in 6 months in saving of oil, coal and packing.
3. It will insure more speed in the revolutions of the engine, say from 1 to 2 strokes per minute, thus increasing the power of the engine. Manufactured by

HOLLAND & THOMPSON, 217 River St., Troy, N. Y.

Katzenstein's Metallic Packing,

(SELF-ACTING)

For Piston Rods, Valve Stems, &c.



Adopted and in use by the principal Iron Works, Engine Builders and Steamship Companies within the last eight years in this and foreign countries; also Tubular Metallic Packing for Slip Joints.

L. KATZENSTEIN & CO.,

169 Christopher St., N.Y.

STEAM PUMPS

SEND FOR PRICES.

VALLEY MACHINE CO. EASTHAMPTON, MASS.

BROCK'S PATENT DROP-FORGED CHAIN PIPE WRENCH

Made Entirely of BAR STEEL,

Six sizes, adapted for pipe from ⅛ to 14" diam.

Each number will fit a range of sizes equal to six or more pairs of common tongs, while it will outwear an equal number of any kind. All parts are interchangeable and can be readily renewed. Jaws are hardened to a saw temper, and can be sharpened with a file. Does not crush the pipe, has a quick grip, never slips, chain will not unhitch while in use, but can be instantly released.

J. H. WILLIAMS & CO., Manufacturers of every Description of IRON AND STEEL DROP FORGINGS,

11 Richards St., near Hamilton Ferry, Brooklyn, N.Y.

CRANK PLANERS

Superior Design & Workmanship, Extra Heavy (1500 lbs.)

DOWN, ANGULAR AND CROSS-FEED,

TO PLANE 12x16x15.

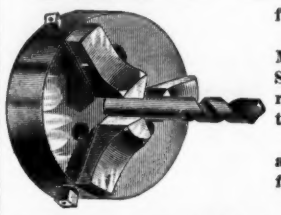
R. A. BELDEN & CO., DANBURY, CT.

ESTABLISHED 1851.

The Horton Lathe Chuck,

ALSO

CHUCKS



for Brass Finishers' Use, Milling Machines, Screw Machines, Upright Drills, Cutting-Off Machines, Drill Lathes, and for Boring Mills for Car Wheel and other work.

THE E. HORTON & SON CO.

Canal St., Windsor Locks, Conn., U. S. A.

Having greater facilities for

—GEAR CUTTING—

than we need at present, we are prepared to cut accurately and with dispatch, all sizes of Spur and Bevel Gears,

from the Smallest to 30 inches Diameter.

S. ASHTON HAND MFG. CO., TOUGHKENAMON, Chester Co., Pa.

DRAWING INSTRUMENTS

Send for 72-Page ILLUSTRATED CATALOGUE.

WM. T. COMSTOCK,

6 Astor Place, - New York.

SHAPING MACHINES

For Hand and Power.

6," 8" and 10" Stroke

Adapted to All Classes of Work to Their Capacity.

CIRCULARS FURNISHED.

BOYNTON & PLUMMER,

Worcester, Mass.

WHITCOMB MFG. CO.,

MANUFACTURERS OF

MACHINISTS' TOOLS

Worcester, Mass.

IRON A Specialty PLANERS

P. BLAISDELL & CO.

Manufacturers of

Machinists' Tools,

WORCESTER, MASS.

THOS. H. DALLETT & CO.,

8 N. 21st St., Philadelphia, Pa.,

MANUFACTURERS OF

PATENT

Portable Drilling Machines,

VERTICAL DRILLS,

Radial Drills, Multiple Drills,

HAND DRILLS.

New Illustrated Catalogue just issued.

EAGLE ANVIL WORKS,

Trenton, N. J.

The Fisher Double Screw Leg Vise.—Warranted stronger grip than any other Vise. Always parallel and cannot be broken.

Send for Circulars.

The Eagle Anvil.—Best Cast Steel Face & Steel Horn. Better than any English Anvil. Fully warranted and lower price.

NOTICE.

Below will be found references to a small portion of the practical articles that have been specially prepared for the AMERICAN MACHINIST, and have appeared in our columns during the last few months. No other mechanical journal in this country has or ever has had such a collection of practical articles, by writers of well known ability, as are presented in these columns week by week. Every issue gives information that is taken up and applied in the shops and factories in various parts of the country. Copies containing these articles can be readily obtained by ordering of any newsdealer, or by writing to this office, at 5 cents per copy.

Wm. M. Barr.

Kaolin and Plaster of Paris as a Boiler Covering. May 17, 1884

Another Explosion in a Pump Plunger. May 31 1884

Frank H. Ball.

Balancing the Reciprocating Parts of Steam Engines. January 3, and February 21, 1885.

Frank H. Richards.

Something About Chucks. January 12, 1884

Running a Lathe. January 12; February 23; March 1; May 3, 17, 1884

Grinding and Using Cutting Tools. May 2, 1885

Grinding Tools Again. June 6, 1885

Screw Cutting on the Engine Lathe. June 13, 1885

Pay Days and Early Closing. August 15, 1885.

Twist Drills and Twisted Arithmetic. July 25, 1885.

George Escol Sellers.

Early Engineering Reminiscences. June 7, 14; July 12; August 9, 23; October 11, 25; November 1; December 13, 20, 1884. February 28 March 14; April 11, August 22, 1885

John W. Nystrom.

Inertia Diagram. Dec. 27, 1884

Inertia. Aug. 30, 1884

George Marshall.

The Result of Imperfect Setting of Horizontal Tubular Boilers. May 24, 1884.

Form and Material of Boilers. June 14, 1884

Agricultural Boilers. September 27, 1884

Boiler Chimneys Considered from an Economical Standpoint. August 16, 1884

Boiler Domes. May 3, 1884

Flanging. May 3, 1884

Braces and Boilers. May 17, 1884

Points in Boiler Construction. August 9, 1884

Thoughts and Hints on Boiler Construction. July 26, 1884

Boiler Fittings, Boiler Tests and Inspection. Feb. 16, 1884

Boiler Plate Stamps, Laminated Plates and Steel Plates. April 26, 1884

Use of Mild Steel in Boiler Construction. March 8, 15, 1884

Boiler Setting. January 26, 1884

Safe and Unsafe Methods of Boiler-Making. Jan. 12, 1884

Boiler Braces. May 3, 1884

Boiler Repairing. May 10, 1884

Objections to Boilers of the Locomotive Type. April 5, 1884

The Care of Boilers. January 26, 1884

English *versus* American Boilers. July 19, 1884

Laying Out Sheet Iron and Boiler Work. August 15, 1885.

Fred. J. Miller.

Universal and Combination Lathe Chucks. May 24, 1884

Making Cutters for Involute Gear Teeth. February 16, 1884

Milling Machines, Tools and Fixtures. September 20, 1884

Pitch of Milling Cutter Teeth. October 4, 1884

Prof. S. W. Robinson.

The Air Brake on Long, Steep Grades. February 16, 1884

L. C. Jewett.

Draft and Finish of Patterns. May 31, 1884.

Making 18" Face Pulley from a 12' Pattern. November 15, 1884

Thos. D. West.

Casting Whole or in Parts. March 22, 1884

Sound Castings. December 6, 1884

Small Castings. March 15 1884

Momentum and Rules for Weighting Down Copes. August 2, and July 26, 1884

Green Sand Cores. January 12, 1884

Foundry Cranes. August 23, 30, and September 6, 1884

Oddity and Science in the Construction of Cupolas . May 10, 1884

Small Cupolas. January 19, 1884

Cylinder Moulding. March 22, 1884

Sweeping Grooved Cone Drums. April 19, 1884

Elements and Manufacture of Foundry Facings. May 24, 31, 1884

Foundry Plant. June 28, 1884

Heavy and Light Work Skimming Gates. November 8, 1884

Intelligence in Melting. February 2, 1884

The Mould Board. March 15, 1884

Ovens and Pits. June 28, 1884

Pipe Patterns. January 12, 1884

John J. Grant.

On a Standard System of Parts for Machine Tools. March 1, 1884

The Milling Machine—Its Construction and Uses. August 25; September 1, 15; October 6, 13, 27; November 3, 10, 17; December 1, 8, 22, 29, 1883. January 12; February 2, 23; March 8, 1884

Isaac Whitehead.

Constructing Gear Patterns. May 24, 1884

Construction of Patterns for Bevel Gears. June 21, 1884

Geometry Applied to Pattern Making. April 26, 1884

Pattern Making. March 29, 1884

Engine Pattern Work. April 19, 1884

Material for Patterns. April 5, 1884

Construction of Circular Patterns. May 3, 1884

Allowance for Shrinkage and Finish in Patterns. June 28, 1884

Copying and Making Patterns From an Old Propeller Wheel. March 1, 1884

How to Strike Up a Propeller Wheel. March 15, 1884

MORSE TWIST DRILL AND MACHINE COMPANY, NEW BEDFORD, MASS.

Sole Manufacturers of Morse Patent Straight-Lip Increase Twist Drill.

SOLID AND SHELL REAMERS, BEACH'S PATENT SELF-CENTERING CHUCK, BIT STOCK DRILLS.

Drills for Coes, Worcester, Hunter and other Hand Drill Presses. Drill Grinding Machines, Center and Adjustable Drill Chucks, Taper Reamers, Milling Cutters, and Special Tools to order.
ALL TOOLS EXACT TO WHITWORTH STANDARD GAUGES.
GEO. R. STETSON, Sup't. EDWARD S. TABER, Pres't and Treas.

IMPROVED RADIAL DRILL,

MANUFACTURED BY

HILLES & JONES,

WILMINGTON, DEL.

THE MOST CONVENIENT DRILL FOR ALL KINDS OF WORK.

The radiating-arm traverses freely in all directions, carrying drill, spindle and gearing backward and forward by rack and pinion and hand wheels. The arm can be placed in any position, radiating from column as a center, enabling a large number of holes to be drilled in succession on the same surface without moving the work. Each machine is double back-geared, with automatic feed motion. Extension base plate is planed off true and slotted. Four sizes

THE STANDARD TOOL CO., CLEVELAND, OHIO.

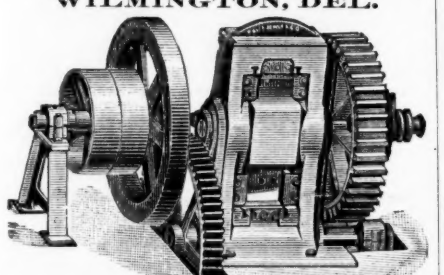
Manufacturers of STRAIGHT LIP INCREASE TWIST DRILLS and Special Tools.

FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS.

JAS. HUNTER & SON, North Adams, Mass.

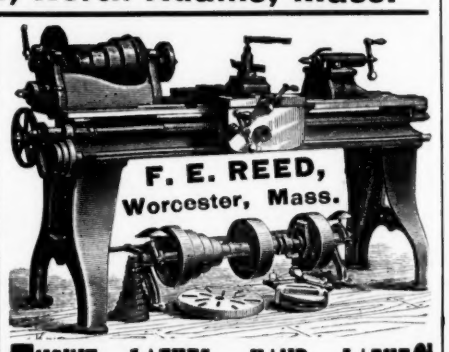
THE PUSEY & JONES CO.

WILMINGTON, DEL.



THIS Cut shows our No. 6 Cutting-Off Shear. Extra strong. For the largest size of iron rails or equivalent bars.

Builders of STEAM ENGINES, Boilers, Tanks, Machinery for Rolling Mills, Punches, Shears, Riveters, Angle-Iron Cutters, Cranes, and Heavy Iron Work generally.



ENGINE ★ LATHES, ★ HAND ★ LATHES

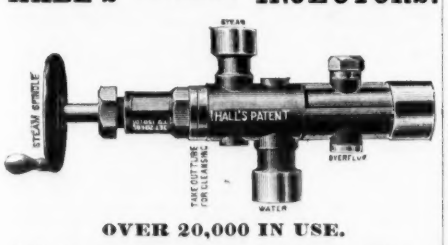
Slide Rests and Planer Centers.

CURRIER & SNYDER,

Upright Drills,

WORCESTER, MASS.

HALL'S —PATENT— AUTOMATIC INJECTORS.



OVER 20,000 IN USE.

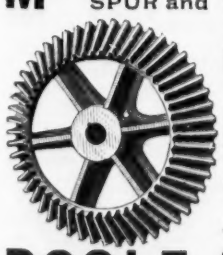
HALL'S ENGINEERING CO.,

112 JOHN STREET, NEW YORK.

OIL CUPS

For Engines, Shafting, &c.
Illustrated Catalogue Free.
J. E. LONERGAN & CO.
Philadelphia, Penna.

MACHINE MOULDED SPUR and BEVEL GEARS,



Pulley Castings, &c.

Special Inducements to the Trade.

List mailed on application.

POOLE & HUNT

BALTIMORE, MD.

American Drawing INK.

Waterproof and general. A liquid substitute for India ink. Finer, blacker and more perfectly fluid than India or any other ink. Will work longer in pen without cleaning or refilling, and will never become gelatinous, thick or offensive, or deposit carbon. Send for catalogue of drawing instruments and materials to

G. S. WOOLMAN,
116 Fulton Street, New York.

C. E. LIPE, Syracuse, N.Y. Send for Circular

"Every-Day" Centers

Discount with Every Pair.

PRICE, ONLY $20.

DETRICK & HARVEY,

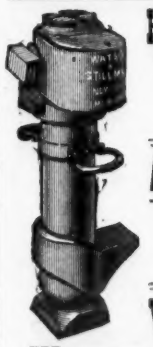
BALTIMORE, MD.

Manufacture Machine Tools and Special Machinery.

SINGLE POST OR OPEN SIDE

IRON PLANERS.

Adapted for long & wide work. Guaranteed equal to the two-post planers in am't and quality of work.



HYDROSTATIC MACHINERY.

PRESSES,
PUMPS,
PUNCHES,

ACCUMULATORS

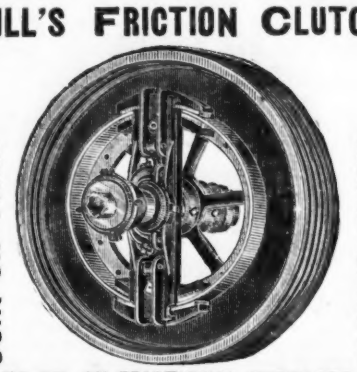
JACKS,
VALVES,
FITTINGS,

VAULT ELEVATORS, &c., &c.

WATSON & STILLMAN, 468 Grand St. New York.

HILL'S FRICTION CLUTCH.

Sent on Trial.



Sold on Its Merits

NO OIL ON FRICTIONAL SURFACES.
Abundant Clearance. Positive Release.
Only CLUTCH Having REMOVABLE Hub.
Send for Catalogue.
ECLIPSE WIND ENGINE CO. BELOIT, WIS.

ESTABLISHED 1855
Buerk's Watchman's Clock,
With Safety Lock Attachment.
20 PRIZE MEDALS AWARDED.

To control watchmen in manufacturing establishments, public buildings, warehouses, etc. Simplest, strongest, cheapest and most complete of its kind.

Price, with 12 keys, complete, $50. Send for circular.

O. E. HAUSBERG, Sole Agent,
71 Nassau Street, Room 3, N.Y.

FRICTION CLUTCH PULLEYS,

Hoisting Engines and Hoisting Machinery,

D. FRISBIE & CO.,

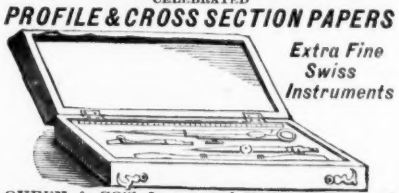
478 North 5th St., Philadelphia, Pa.

"ACME" DRAWING PAPERS

QUEEN & CO'S

CELEBRATED

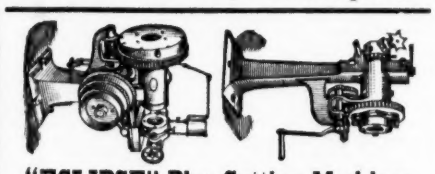
PROFILE & CROSS SECTION PAPERS



Extra Fine Swiss Instruments

QUEEN & CO'S Improved TRANSITS and LEVELS, Tapes, Chains, Rods, Rules, and Drawing Materials of every description. List and description of our Ten Catalogues sent on application.

JAMES W. QUEEN & CO.
924 Chestnut St., Philadelphia.



"ECLIPSE" Pipe-Cutting Machines

FOR HAND OR POWER.

Don't you have sufficient Pipe-Work about your Mill, Factory, or Shops to make a powerful, convenient and very compact Pipe-Cutting Machine soon pay for itself, providing it could be had at a moderate price?

Mention this paper and write us for particulars.

PANCOAST & MAULE,
Philadelphia, Pa.

Made In Three Sizes, Cutting Pipes ¼ to 6 Inch.

DROP FORGINGS OF IRON OR STEEL

BEECHER & PECK, NEW HAVEN CONN.

PECK'S PAT. DROP PRESS.

BEECHER & PECK, NEW HAVEN CONN.

J. C. HOADLEY,

CIVIL AND MECHANICAL ENGINEER

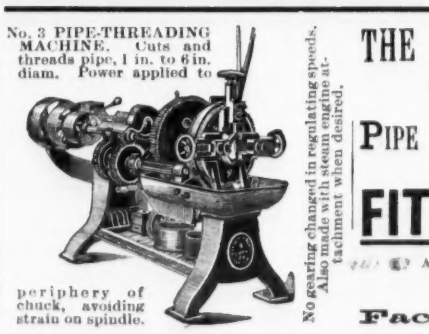
and Expert in Patent Causes,
28 STATE STREET, ROOM 28, BOSTON, MASS.

Iron and Steel

DROP FORGING

Of Every Description, at Reasonable Prices.

R. A. BELDEN & CO., DANBURY, Ct.



D. SAUNDERS' SONS

MANUFACTURERS OF THE ORIGINAL

TRADE I. X. L. MARK.

Pipe Cutting and Threading Machine.

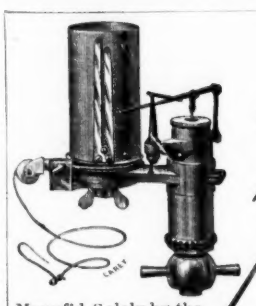
BEWARE OF IMITATIONS.

None genuine without our Trade-mark and Name.

STEAM AND GAS-FITTERS' HAND TOOLS.

Pipe Cutting and Threading Machines, for Pipe Mill Use, a Specialty.

Send for Circulars. YONKERS, N. Y.



SEE REFERENCE.

Manuf'd Solely by the

American Steam Gauge Co.,

Boston, Mass.

Engineers allowed special terms.

PHILADELPHIA, July 22, 1884.

AMERICAN STEAM GAUGE CO., BOSTON, MASS.

Gents—The Thompson Indicator which you furnished me has given good satisfaction. I have used it frequently upon high-speed engines, with indicators of other makers, and have not yet had occasion to regret the choice which I made when I selected yours.

Respectfully yours,
H. L. BUTLER.

FAY & SCOTT, Dexter, Me.

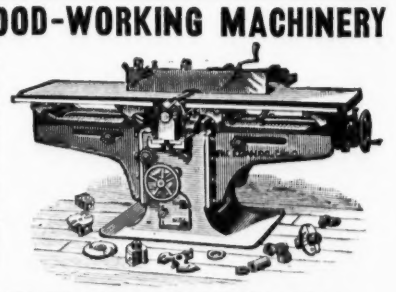
MANUFACTURERS OF

WOOD LATHES,

Drill Lathes, Shaping Machines, Milling Machines, Planer Centers, &c.

SEND FOR CATALOGUE.

WOOD-WORKING MACHINERY



New Universal Wood Worker, Planing and Jointing Side.

THE EGAN COMPANY, Mfrs.,

Successors to The Cordesman & Egan Co.,

201 to 221 WEST FRONT ST., CINCINNATI, OHIO.

CHARLES MURRAY

ENGRAVER ON WOOD

58 ANN ST. NEW YORK.

MACHINERY

For Reducing and Pointing Wire.

Especially adapted to pointing wire rods and wire for drawing.

For Machines or information, address the manufacturer.

S. W. GOODYEAR, Waterbury, Ct.

No. 3 PIPE-THREADING MACHINE. Cuts and threads pipe, 1 in. to 6 in. diam. Power applied to

periphery of chuck, avoiding strain on spindle.

No gearing changed in regulating speeds. Also made with steam engine attachment when desired.

THE EATON, COLE & BURNHAM CO.

82 & 84 Fulton Street, New York,

MANUFACTURERS OF

PIPE CUTTING and THREADING MACHINES

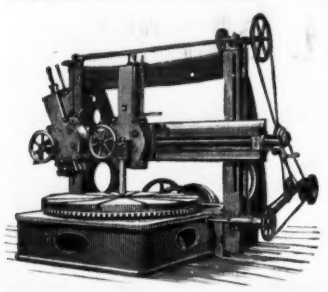
OPERATED BY HAND OR POWER.

FITTINGS, VALVES, PIPE, PIPE TOOLS,

AND ALL STYLES OF IRON AND BRASS GOODS FOR

STEAM, WATER AND GAS.

Factory, Bridgeport, Conn.



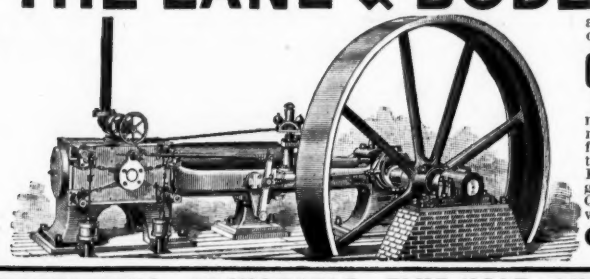
WILLIAM SELLERS & CO.,
Philadelphia, Pa.

Machine Shop and Railway
EQUIPMENTS.

Shafts, Couplings, Hangers, Pulleys, Mill Gearing, etc., Lathes, Planers, Drills, Shapers, Bolt Cutters, Railway Turntables, and Pivot Bridges, Gifford Injectors, Sellers' Improvements, New Patterns, Simple, Effective.

New York Office, - No. 79 Liberty Street.

THE LANE & BODLEY CO.



are making special figures on 16, 18 and 20 inch

CORLISS ENGINES

These Engines are from new heavy patterns, are more liberally proportioned for strength and durability than any in the market. Economy and Regulation guaranteed equal to any. Quality of material and workmanship, the **Best.**

CINCINNATI O.

HARRISON'S ADJUSTABLE FLUE-HOLE CUTTER.

An effective labor-saving tool for the boiler shop. holes from 2 to 5 inches, inclusive. The cutters proper are forged from ⅝-inch round steel, can be renewed at trifling cost; are easily adjusted and firmly held. Size No. 1 cuts all size

Manufactured by
REMINGTON & CO.,
WILMINGTON, DEL.

L. S. STARRETT,
Manufacturer of
FINE TOOLS
ATHOL, MASS.
SEND FOR FULL LIST.

THE EDDY FRICTION CLUTCH PULLEY.

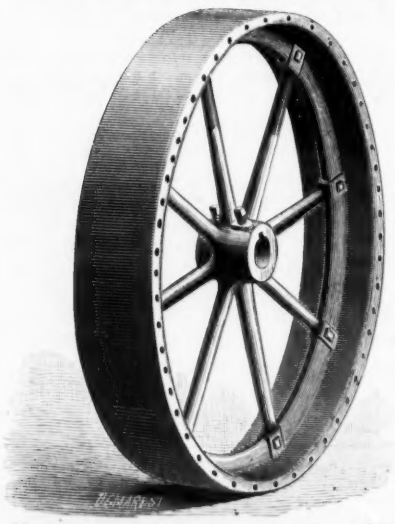
Illustrated in AMERICAN MACHINIST of June 27, 1885. For single Frictions or "Shop Rights" apply to patentee,
WM. H. EDDY, Worcester, Mass.

STANDARD KNIFE EDGE, STRAIGHT EDGES IN CASE, WITH TEST BAR AND NON-CONDUCTOR.

SEND FOR CATALOGUE.

HARTFORD TOOL CO., HARTFORD, —CONN.—

PAPER PULLEYS



WITH WEB OR ARMS.

Transmitting power over **three to one** as compared with iron. No slipping belts or tighteners. Weight less than one-half. Strength and durability of the greatest. Freights less. Prices satisfactory. Send for Circular, Prices and Discounts. Also, FRICTION and POLISHING WHEELS.

WESTINGHOUSE, CHURCH, KERR & CO.,
Consulting and Contracting Engineers,
17 CORTLANDT ST., NEW YORK.

Also controlling the Westinghouse and Reynolds' Corliss Engines, the Huyett & Smith Fans, &c.

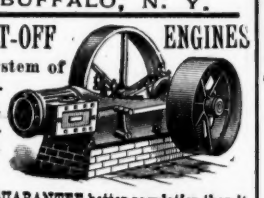
EUREKA BAND SAW.

We build three sizes, at prices lower than an equally good Band Saw can be had elsewhere. For further information, inquire of

FRANK & CO.,
176 Terrace Street,
BUFFALO, N. Y.

AUTOMATIC CUT-OFF ENGINES

Embodying a New System of Regulation. The Governor weighs the Load. The most perfect Governing ever obtained. Send for circular **A.**



BALL ENGINE CO. ERIE, PA.

WE GUARANTEE better regulation than it is possible for any other ENGINE to give

BOUND VOLUMES OF THE AMERICAN MACHINIST

for 1880, 1881, 1882, 1883 and 1884, cloth, $3.50 each, purchasers paying express charges.
AM. MACHINIST PUB'G CO., 96 Fulton St., New York

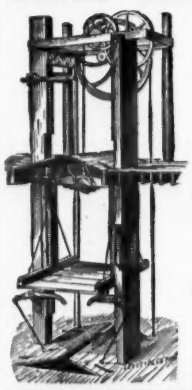
FOX AND TURRET
SPEED LATHES.

BRASS FINISHERS' TOOLS.

GEO. GAGE, WATERFORD, N. Y.

E. P. BULLARD, Ag't., 14 Dey St., NEW YORK.

MORSE ELEVATOR WORKS.



Morse, Williams & Co.,
(Successors to Clem & Morse)
Builders of all Kinds of
PASSENGER & FREIGHT
Elevators

Office, 411 Cherry St.

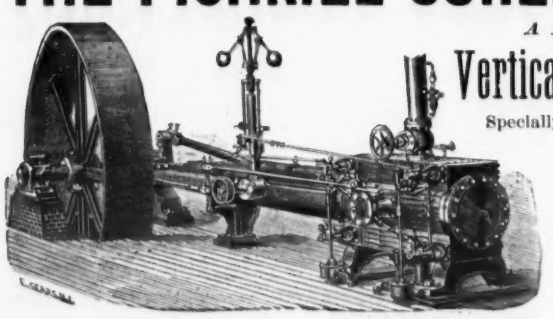
Works, Frankford Ave., Wildey and Shackamaxon Sts.,
PHILADELPHIA.

New York Office, 108 Liberty St.

FRANCIS H. EASBY,
THE SPECIAL MACHINE WORKS,
LEHIGH AVE. AND MUTTER ST., PHILADELPHIA.
—EXPERIMENTAL WORK CAREFULLY BUILT.—

THE FISHKILL CORLISS ENGINE,

A FULL LINE OF SIZES.



Vertical Condensing Engines

Specially adapted for and extensively used in large grain elevators.

BOILERS.

Manufactured by the
Fishkill Landing Machine Co.
FISHKILL-ON-THE-HUDSON, N.Y.

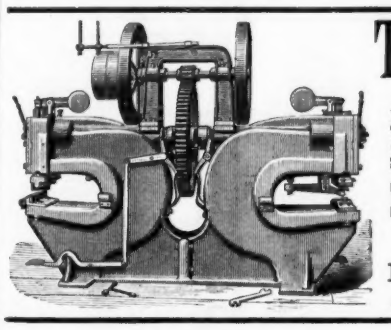
Send for Catalogue A, containing Illustrated Descriptions and References

SOUTHWARK FOUNDRY AND MACHINE CO.

ENGINEERS AND MACHINISTS,
430 WASHINGTON AVENUE, PHILADELPHIA, PA.

PORTER-ALLEN & SOUTHWARK ENGINES.

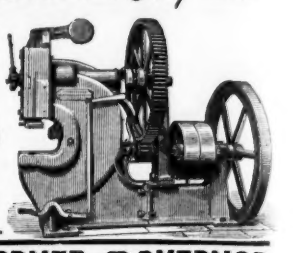
BLOWING ENGINES, PUMPS, GAS APPARATUS,
HYDRAULIC MACHINERY, &c., &c.



THE LONG & ALLSTATTER CO., Hamilton, OHIO.

Double, Single, Angle-Bar, Gang, Horizontal, Twin, Boiler, Spacing, Gate, Multiple, Belt and Steam-Driven

Punches and Shears,
Over 300 Sizes.
ALSO,
Power Cushioned Hammer.



Send for new catalogue.

Patent Binders
—FOR—
AMERICAN MACHINIST,

to hold 52 issues. Price $1 each, by mail or express to any part of the United States. Also "COVERS" to be applied by bookbinders for permanently binding any volume. Same price.

American Machinist Pub'g Co.,
96 FULTON STREET, NEW YORK.

THE GARDNER GOVERNOR.

Over 30,000 in use.

Adapted to every style of stationary and portable steam engine.

Warranted to give satisfaction or no sale.

For circulars and prices, address,

The Gardner Governor Co.,
QUINCY, ILL.

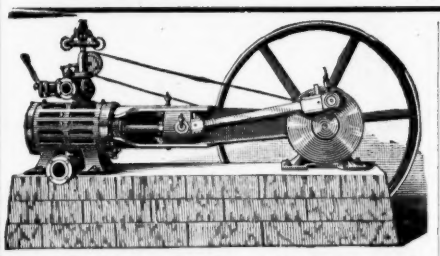
THE BEST IN THE WORLD.

JENKINS STANDARD PACKING TRADE MARK

We make the Best Packing that can be made regardless of cost. Users will sustain us by calling for the "JENKINS STANDARD PACKING."

Our "Trade Mark" is stamped on every sheet. None genuine unless so stamped. ☞ Send for Price List A.

JENKINS BROS.,
71 John St., N. Y. 79 Kilby St., Boston.



STEARNS MFG. COMPANY,
ERIE, PA.

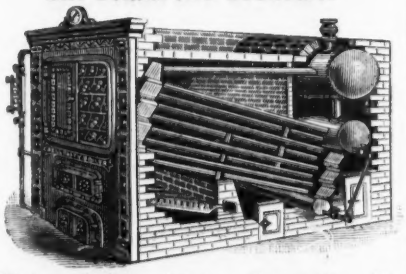
Engines from 15 to 400 Horse Power.

Boilers of Steel and Iron supplied to the trade or the user Send for Catalogues.

SAW MILLS and GENERAL MACHINERY.
Works at ERIE, PA.

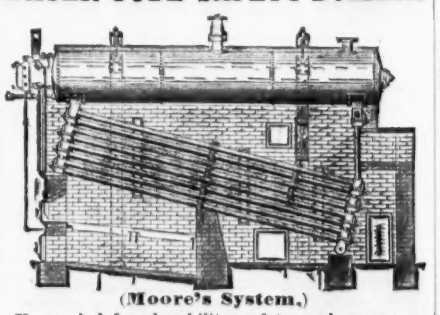
ZELL SAFETY BOILER
DRY STEAM AND ECONOMY.

SEND FOR CIRCULAR.



Address, Safety Steam Generator Co.
68 WARREN STREET, NEW YORK.

WATER TUBE SAFETY BOILERS

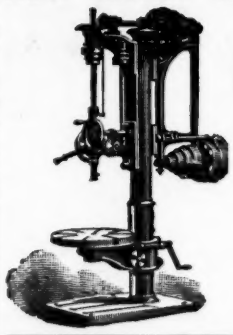


(Moore's System.)

Unequaled for durability, safety and economy. Examinations made with ease. Cleaned quickly and easily. Circulation rapid and sure.

National Water Tube Safety Boiler Co,
N. Y. ENGINEERING CO., 64 CORTLANDT ST.
Circulars and Testimonials.

NEW HAVEN MANUF'G CO.,
New Haven, Conn.



Lathes,
Planers,
Shapers,
Slotters,
Etc.

THE LOWE
Feed Water Heater
AND PURIFIER.

This Heater has seamless straight tubes, brass or copper. No necessity for bent or bowed tubes, because construction provides for the differential expansion between shell and tubes. Adapted for high or low pressure engines. Saving in fuel and boiler repairs guaranteed.

Least Back Pressure on Engine.
Reliable Water Purifier.
The Highest Results Obtained from Exhaust Steam.

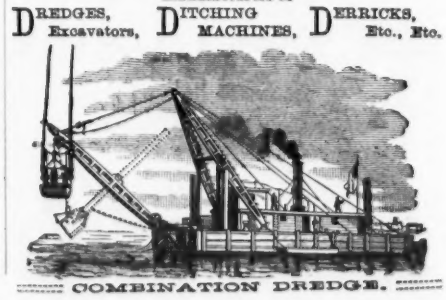
Write for "HISTORY OF FEED WATER HEATERS," free, on application to

WILLIAM LOWE,
Patentee and Sole Manufacturer,
BRIDGEPORT BOILER WORKS,
BRIDGEPORT, CONN.

OSGOOD DREDGE CO., - ALBANY, N. Y.

RALPH R. OSGOOD, Pres. JAMES H. BLESSING, Vice-Pres.
JOHN K. HOWE, Secretary and Treasurer.

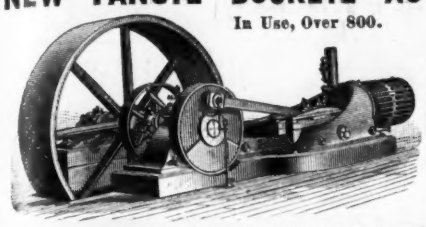
Manufacturers of
DREDGES, Excavators, DITCHING MACHINES, DERRICKS, Etc., Etc.



COMBINATION DREDGE.

NEW TANGYE BUCKEYE AUTOMATIC CUT-OFF ENGINES.

In Use, Over 800. 25 to 1000 H. P.



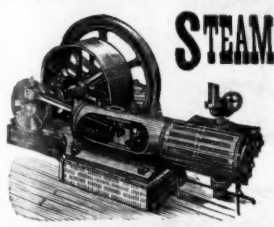
These Engines are the combined result of long experience with automatic cut-off regulation, and most careful revision of all details. They are designed and constructed for heavy and continuous duty at medium or high rotative speeds. Highest attainable Economy in Steam Consumption and superior regulation guaranteed. Self-Contained Automatic Cut-Off Engines, 12 to 100 H.P., for driving Dynamo Machines *a specialty*. Illustrated Circulars with various data as to practical Steam Engine construction and performance, free by mail. **Address, BUCKEYE ENGINE CO., Salem, Ohio.**

SALES AGENTS: GEO. A. BARNARD, 70 Astor House, N. Y. and 53 Mason Building, Boston, Mass. | D. L. DAVIS, 34 S. Canal St., Chicago, Ill. and ROBINSON & CARY, St. Paul, Minn.

KENSINGTON ENGINE WORKS, LIMITED, PHILADELPHIA,

Sole Licensees and Manufacturers for New Jersey (South of Trenton), Eastern Pennsylvania, Delaware, Maryland and Virginia.

The Beckett & McDowell Mfg. Co.



STEAM ENGINES

Hoists, Pumps AND GENERAL Mining Machinery.

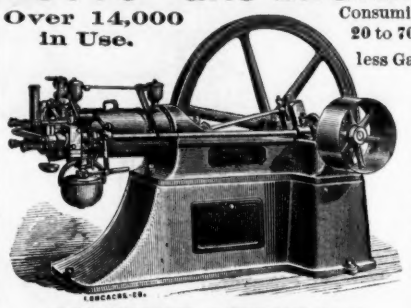
120 LIBERTY ST., NEW YORK.

Send for Illus. Catalogue.

"OTTO" GAS ENGINE.

Over 14,000 in Use.

Consuming 20 to 70% less Gas than any other engine.



SCHLEICHER, SCHUMM & CO.,

33d & Walnut sts., Phila. 214 Randolph st., Chicago.

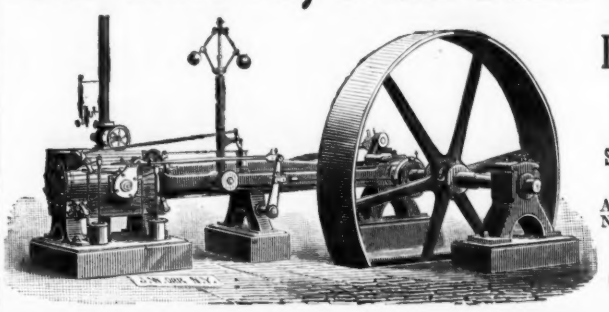
W. C. YOUNG & CO.,

Worcester, Mass., Manufacturers of

Engine Lathes, Hand Lathes,

FOOT POWER LATHES, SLIDE RESTS, Etc.

THE WATTS, CAMPBELL CO., NEWARK, N.J.,



MANUFACTURERS OF

Improved Corliss Steam Engines

IN FULL VARIETY.

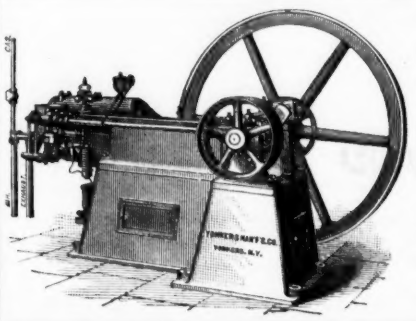
Sizes varying from 30 to 2000 H. P.

Horizontal or Vertical, Direct Acting or Beam, Condensing, Non-Condensing or Compound, Send for Circular.

BRANCH OFFICE:

Cor. 5th and Chestnut Sts., PHILADELPHIA, PA.

THE PARKER GAS ENGINE.



SIMPLE! SAFE! NO SMOKE! NO FLAME! NO MATCHES USED! NO SLIDE VALVE! DURABLE! EFFECTIVE!

Unsurpassed economy in use of Gas. One turn of the fly-wheel, acting upon the small dynamo, creates an electric spark sufficient to start the engine running.

Sizes, 2 to 10 horse-power. Send for Illus. Circular.

YONKERS MFG. CO. SALESROOMS: 16 Dey St., N.Y.

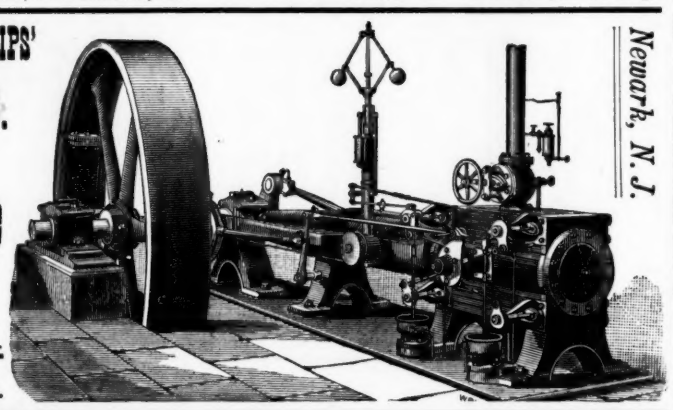
HEWES & PHILLIPS' Iron Works.

IMPROVED

Corliss Engine

High Pressure,
—Condensing—
And Compound.

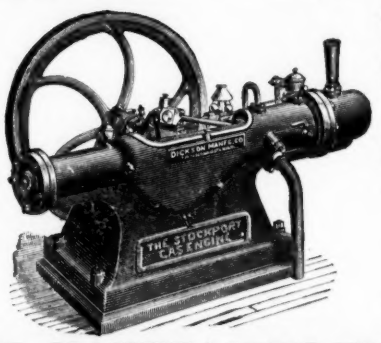
SEND FOR CIRCULAR.



Newark, N. J.

THE STOCKPORT UNEQUALED GAS ENGINE

FOR Simplicity, Durability, Reliability, Economy, Lightness AND General Design.



Starts with ease.

Receives an impulse at every revolution.

Runs silently.

Uses less gas per H.-P. than any other engine.

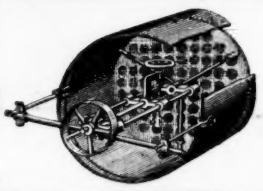
SEND FOR CIRCULAR GIVING PARTICULARS OF SIZES AND PRICES.

THE DICKSON MANUFACTURING COMPANY,

Locomotives, Stationary Engines, Boilers, Mining Machinery,

SCRANTON, PA. 112 LIBERTY ST., NEW YORK.

Patent Portable Drilling Machine



For Drilling Smoke Boxes and Cylinder Saddles in place.

Circulars on Application. Send stamp for Catalogue.

FLANDERS MACHINE WORKS, L. B. Flanders, Pedrick & Ayer, Prop'rs,

PHILADELPHIA, PA.

BUILDERS OF

BOILERS, GAS HOLDERS, GAS GENERATORS,

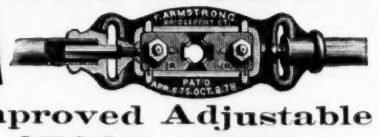
WARDEN & MITCHELL,

Germantown Junc., Philadelphia.

Hydraulic Riveting Plant and full facilities.

TANKS, STILLS, BRIDGES, ETC., ETC.

ARMSTRONG'S



Improved Adjustable STOCK AND DIES FOR PIPE and BOLTS.

Tapped to Standard Gauges. *Adjustable* to all variations in the size of fittings. Can be *resharpened without drawing the temper* by simply grinding them. Possessing practical advantages appreciated by all mechanics. Circulars sent free on application.

Manufactured by

F. ARMSTRONG, BRIDGEPORT, CONN.

THE SEIBERT CYLINDER OIL CUP CO.

Manufacturers of

OIL CUPS FOR LOCOMOTIVE, MARINE AND STATIONARY ENGINE CYLINDERS,

Under the Seibert and Gates Patents with Sight Feed.

Also The WILKINSON CRANK PIN

Device for Marine and Stationary Engines.

Send for Catalogue and Price Lists.

SEIBERT CYLINDER OIL CUP CO.,

26 Vesey Street, - - NEW YORK.
53 Oliver Street, - BOSTON, Mass.

HODGE'S

Universal Angle Union

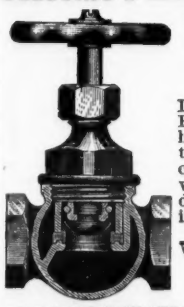
PATENTED.

Combining an elbow and union, and can be set at any angle at which it is desired to run the pipe.

Manufacturers & Wholesale Agents,

ROLLSTONE MACHINE CO., 45 Water St., FITCHBURG, MASS.

BLESSING'S PATENT RENEWABLE-SEAT Stop and Check Valves.



The Renewable Seats and Discs are cast from the best Phosphor Bronze Metal, which has lasting qualities, double that of the best Steam Metal commonly used in first-class valves. The Seats are simply dropped into place and held in position by bottom of cage.

We also manufacture the Albany Bucket and Gravitating Steam Traps.

ALBANY STEAM TRAP CO., Albany, N. Y.

PATTERN & MODEL MAKER.

GEO. E. KNOWLES, 69 BEEKMAN ST., NEW YORK.

PATTERNS of all descriptions made and inventions PERFECTED.

THE BABCOCK & WILCOX CO.,

WATER TUBE STEAM BOILERS.

30 Cortlandt Street, New York.
107 Hope St., Glasgow, Scotland,

BRANCH OFFICES:

BOSTON: 50 Oliver Street.
PHILAD'A: 32 N. 5th Street.
PITTSBURGH: 98 4th Ave.
CHICAGO: 64 S. Canal St.
CINCINNATI: 64 W. 3rd St.
NEW ORLEANS: 54 Carondelet Street.
SAN FRANCISCO: 561 Mission Street.
HAVANA: 50 San Ignacio.

Send to nearest office for circular

AXLE MACHINERY.

A complete lot of modern machinery for manufacturing Carriage Axles.

Tools have been in use about three years.

Will sell one machine or the lot to suit customer, immediate delivery.

LIST.

2 Kingsley Helve Hammers.
1 Bradley Helve Hammer, 100 pounds.
4 14-in. x 4½ Putnam Engine Lathes.
8 17-in. 6½ Putnam Engine Lathes.
2 Pratt & Whitney No. 4 Back-geared Nut Tapping and Facing Machines (or Screw Machines).
2 Pratt & Whitney Axle Threading Machines with Turret Head.
1 Pratt & Whitney Milling Machine, Hand Feed.
1 Wilder Bar Iron Cutter, capacity 2¼" square iron.
1 Bar Iron Cutter, capacity, 3½ inch square iron.
1 Sturtevant No. 4 Steel Pressure Blower and countershaft.
2 Reaming Machines, quick-acting, excellent tools.
2 Tumblers, 4 ft. x 2 ft.
1 Revolving Forge.
3 Cast Iron Forges.
1 Platform Scale.

A large and valuable lot of Small Tools, fitted to above machines, and adapted to the business.

We have a full line of new machinery, and are prepared to make low quotations. Agent for the following firms, write full particulars of what is wanted:

NEW YORK AGENT FOR

Brown & Sharpe Manufacturing Co.
Powell Machine Tool Co.
P. Blaisdell & Co.
Prentice Bros.
Bradley's Cushion Hammer.
National Mchy. Co. Bolt and Nut Mchy.
Hilles & Jones' Boiler Tools.
Slate's Sensitive Drills.
Elliott's Drills. Gage Brass Lathes.

E. P. BULLARD, 14 Dey St., New York.

New Machinery For Sale,

—VERY LOW.—

1 Engine Lathe, 18 in. x 8½ ft. Dustin.
1 Fox Lathe, 15 in. 5½ ft. American Tool and Machine Company.
1 Engine Lathe, 16 in. x 7 ft. Bridgeport Machine and Tool Works.
1 Engine Lathe, 18 in. x 8 ft. Lodge & Barker.
1 " " 24 in. x 12 ft. " "
1 No. 3 Milling Machine. Newton.
1 Nut-facing Machine. Grant & Bogert.

SAMUEL J. CLARKE,

Nos. 2 and 4 Stone Street, New York.

EXTRA HEAVY LATHE

WE ARE MAKING A SPECIALTY OF A 24-INCH LATHE, WITH BED ANY LENGTH DESIRED. THIS LATHE IS DESIGNED FOR SEVERE SERVICE; IT IS THE HEAVIEST OF ITS SIZE EVER PRODUCED, AND THE WORKMANSHIP AS GOOD AS SKILL CAN MAKE IT.

SEND FOR CIRCULAR.

S. S. HEPWORTH & CO., "Glenwood Station," Yonkers, N. Y.

SPECIAL INDUCEMENTS.

SECOND-HAND MACHINERY FOR SALE.

Two Engine Lathes, 87-in. swing, 20-ft. bed. Comp'd rest. Screw feed geared in face plate on each.
One Engine Lathe, 20-ft bed, 4[illegible]inch swing.
One Engine Lathe, 16-ft. bed, 48-in. swing. Bement's make.
One Engine Lathe, 12-ft. bed 25-in. swing. Bement's make.
One Iron Planer, planes 24 ft. long, 62 in. x 62 in. Excellent condition.
One Iron Planer, planes 16 ft. long, 42 in. x 42 in. Bement's make.
One Iron Planer, planes 11 ft. long, 36 in. x 36 in. Bement's make.
One Iron Planer, planes 8 ft. long, 30 in. x 30 in.
Five Iron Planers, to plane 4 ft. 6 in., 24½ in. x 24½ in.
Four Iron Planers, to plane 5 ft., 20 in. x 20 in.
One 5-ft. Radial Drill. Bement's make.
One 40-inch B.G.S.F. Upright Drill.
One 40-inch B.G S.F. Upright Drill. Bement.
One 42-inch Car Wheel Borer. N.Y.S.E.Co.'s make.
Two Axle Lathes.
Two Durrell's 7-Spindle Nut Tappers.

Send for list of New and Second-hand Tools, too long for publication.

THE GEORGE PLACE MACHINERY CO.

121 Chambers & 103 Reade Sts.,

NEW YORK.

B. BURBANK & CO., Evansville, Ind.

FLUOR SPAR

Office of the Domestic Mfg. Co., Newark, N.J., May 23, '85.
B. BURBANK & CO.

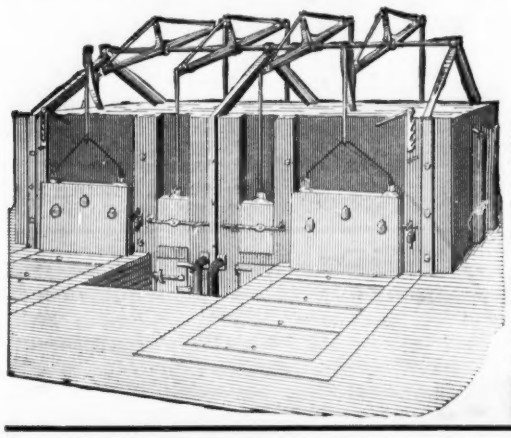
Dear Sirs:—In answer to your inquiry, would say that we have used your Fluor Spar for several years with entirely satisfactory results.

Yours truly, ROBERT BLAKE.

BROWN & SHARPE MFG. CO. Providence, Rhode Island.

MAKE

Annealing and Case Hardening



FURNACES

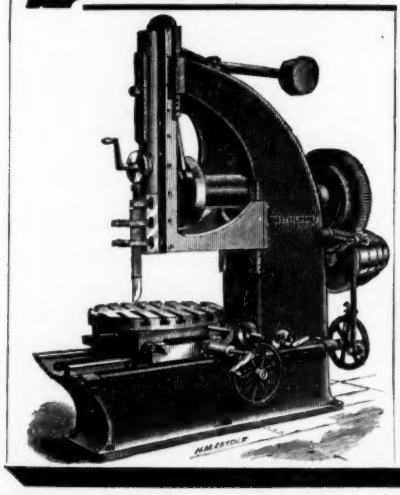
For Machinists' Use.

The accompanying cut represents our Annealing Furnace, the Case Hardening Furnace being of the same construction, but having the oven floor two feet above the ground. These furnaces we have had in constant use for several years; they were designed for the expeditious and economical annealing of cast iron or steel and the case hardening of wrought iron or steel, and have proved very satisfactory.

We have on hand complete sets of patterns for case hardening and two sizes of annealing furnaces, from which we are prepared to furnish iron work complete, ready for erection, or castings and special tiles, with blue prints showing construction of same.

ILLUSTRATED AND DESCRIPTIVE CIRCULAR, WITH PRICES, MAILED ON APPLICATION.

SLOTTING MACHINES



9, 13 and 18 in. Stroke. New Patterns.

RAM GUIDE

ADJUSTABLE VERTICALLY.

Feeds always take place at upper end of stroke—never during cut.

VERY HEAVY AND POWERFUL.

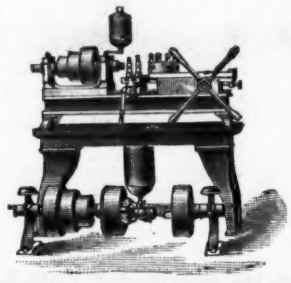
NILES TOOL WORKS,

Hamilton, Ohio.

PHILADELPHIA, - 713 Chestnut St.
CHICAGO, - Gaff Building, La Salle St.

THE PRATT & WHITNEY CO.,

HARTFORD, Connecticut.



MANUFACTURE

HORIZONTAL

Boring Mills,

48 in. and 66 in. Swing.

Double Head Traverse Drills

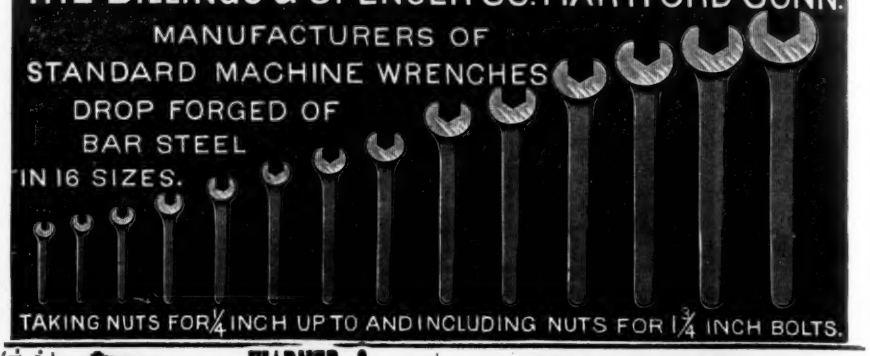
For 5/8 in., 3 in. and smaller holes.

Revolving Head Drilling Machines.

Monitor Head Lathes and Screw Machines, Screw Slotting and Shaving Machines, Rifling Machines, Spring Coiling Machines.—Price List and Description furnished on Application.

THE BILLINGS & SPENCER CO. HARTFORD CONN.

MANUFACTURERS OF
STANDARD MACHINE WRENCHES
DROP FORGED OF
BAR STEEL
IN 16 SIZES.



TAKING NUTS FOR 1/4 INCH UP TO AND INCLUDING NUTS FOR 1 3/4 INCH BOLTS.

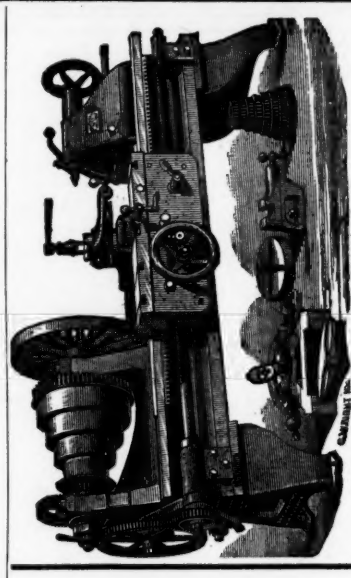
Vertical Milling Machine.

WARNER & SWASEY,

CLEVELAND, OHIO.

Machine Tools FOR **IRON & BRASS WORK.**

Send for Illustrated Catalogue.



Engine Lathes, Planers, Drills, &c.

SUCCESSORS TO **DAVID W. POND,**

New Designs, Quick Delivery, Great Variety. Worcester, Mass.

WESTON'S PATENT POWER TRAVELING CRANES

OF ANY CAPACITY.

Particulars on application, and full specification and tender promptly submitted on receipt of capacity and span of bridge desired.

SOLE MAKERS:

The Yale & Towne M'f'g Co.,

STAMFORD, CONN.

NEW YORK, 62 Reade Street. | CHICAGO, 64 Lake Street.
BOSTON, 224 Franklin Street. | PHILADELPHIA, 15 N. Sixth Street.

GENERAL CRANE CATALOGUES ON APPLICATION.

GEO. W. FIFIELD,

MANUFACTURER OF

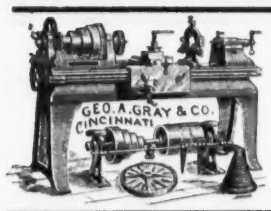
ENGINE LATHES

FROM 16 to 48 IN. SWING.

Cuts, Photographs and Prices furnished on application.

Lowell, Mass., U. S. A.

J. M. ALLEN, PRESIDENT.
W. B. FRANKLIN, VICE-PRESIDENT.
J. B. PIERCE, SECRETARY.



G. A. Gray, Jr. & Co.

CINCINNATI, O.

$200.

14 INCH 6 FEET

WORK SHOPS

Without Steam Power

BY USING OUTFITS OF

BARNES' PAT. FOOT POWER

machinery can compete with steam power. **Sold on trial.** Metal and wood workers send for prices. Illustrated catalogue free.

W. F. & JNO. BARNES CO., ROCKFORD, ILL.

Address, No. 1995 Main Street.

GEAR WHEELS and GEAR CUTTING.

Gears cut or made to order. Of every kind, spur, bevel, worm, rack, ratchet, internal, etc. Of any size, from a quarter-inch to six feet diameter. In any material. In any quantity. Small gears on hand for free delivery by mail. Send for illustrated price list.

GEO. B. GRANT, 66 Beverly St., Boston.

KEY SEATING MACHINES

AND

20 in. Drills a specialty.

Our 20 in. Drill is a heavy substantial tool, made for service, has steel shafts and spindle. Gears and racks cut from the solid and have all modern improvements, are made by special machinery, and sold very low.

Our Key Seating Machine will save enough in 60 days' use to pay first cost; no shop can afford to do without one. We have now ready for prompt shipment, both Key Seat Machines and 20 in. Drills. Send for Photo. and Catalogue.

W. P. DAVIS, North Bloomfield, N.Y.

PUNCHING PRESSES,

ROP HAMMERS

Dies and other Tools for the manufacture of all kinds of **SHEET METAL GOODS,** Drop Forgings, &c.

Stiles & Parker Press Co., Middletown, Conn.

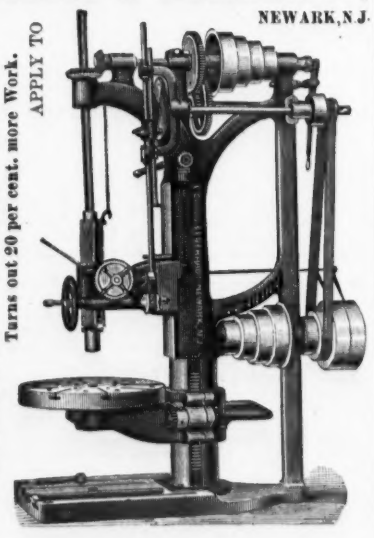
BRANCH FACTORY AND OFFICE, 59 DUANE STREET, N. Y.

E. GOULD & EBERHARDT,

NEWARK, N.J.

EBERHARDT'S NEW DRILL

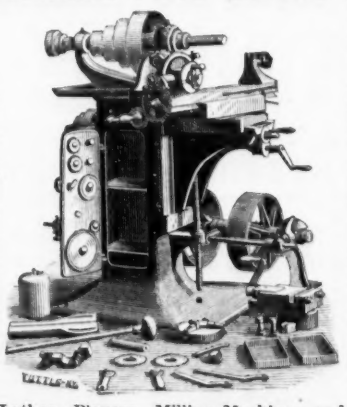
Turns out 20 per cent. more Work. APPLY TO



E. E. CARVIN & CO.,

MANUFACTURERS OF

Machinists and Iron Workers' Tools



Universal Milling Machine.

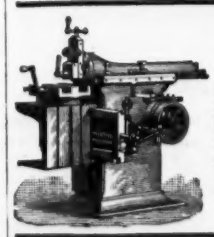
WE RECEIVED **GOLD MEDAL** FOR OUR NEW UNIVERSAL MILLER AT NEW ORLEANS EXPOSITION. (see cut)

Lathes, Planers, Milling Machines and Drills. Special Tools for all kinds of manufacturing to order. Gear and Rack Cutting, Milling and Index Drilling to order.

Nos. 139 to 143 CENTRE ST., NEW YORK.

THE BUFFALO STEEL FOUNDRY, BUFFALO, N. Y.

ORDERS AND CORRESPONDENCE SOLICITED. | PRATT & LETCHWORTH Proprietors.

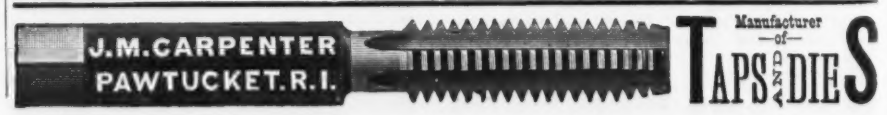


THIS SHAPER HAS 26-INCH STROKE.

All the adjustments are made without operator moving from his position. It is made to act as a SLOTTING MACHINE, and is so arranged that KEY SEATS may be cut in any part of a shaft of any length, and from 4 inches in diameter down, and will plane a block 26″x26″x20″. Has SWIVEL GRADUATED VISE, two changes of speed, and is geared 36 to 1. It is very heavy and powerful, and is guaranteed to give perfect satisfaction.

Manufactured by **LODGE, BARKER & CO.,** CINCINNATI, O.

Manufacturers of Iron and Brass-Working Machinery.



Manufacturer of **TAPS AND DIES**